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VIEWS, NEWS AND INTERVIEWS.

Greenwich observatory is to be lighted by electricity. The observatory will be equipped with an electric lighting plant of its own, the dynamo of which will be driven by a gas engine. To prevent any effect on the magnetographs the dynamo will be inclosed in a triple iron shield.

An electric ambulance is the latest development in St. Louis. It will be as swift and steadier than a vehicle drawn by horses, and will be given right of way by the street car companies. In some cities the electric street railways want to undertake the carriage of the city scavenging, and there seems no reason why they should not do the work well. In Ottawa, the street railway has offered to carry the mails between the depots and the post office. It looks as if the time was coming when a citizen would have to take an electric ride out into the country to see a horse.

The electric company, at Alton, Ill., is using a horse for stretching electric wires on the poles, and he gets them in their proper places in a speedy and satisfactory manner.

The General Electric Company, of Berlin, proposes to adopt the new clock of Herr von Hefner-Alteneck, which may be placed in circuit like an ordinary incandescent lamp, and is claimed to solve the problem of providing an inexpensive yet effective system of electric control of clocks. The current keeps the clock wound at an annual cost not exceeding that of one 16-candle lamp burning for 10 hours—perhaps eight or ten cents. Should the circuit be broken, the clock will run without the current about 12 hours. The regulation can be performed by hand from the dynamo room or automatically from an observatory, and consists of a momentary lowering of the circuit potential by six to ten volts at 5 A. M., the effect being to set all the clocks in the circuit at 5. The lamps are not appreciably affected.

Engineer Martin of the Brooklyn bridge is in Chicago this week examining the motive power of the intramural railway in the World's Fair grounds.

The National Society of Electro-Therapeutists held its first annual meeting in this city last week. Dr. William Harvey King, of New York, president of the society, made an address. Papers were read by Dr. M. B. Finn, of Worcester, Mass., and others.

The new electric light plant at Huron, In., is now in operation.

A Portland merchant is now manufacturing sausages by electricity. But this is hardly an innovation. There has always been from very early days something electrical about a sausage.

Last week Yale students were astonished to see their historic campus illuminated by many brilliant arc lamps. This is the first time in the history of the university that lights of any kind have been used on the campus, and college sentiment was very strong against the innovation. But sentiment constitutes a minor barrier to modern progress, and the arc lights continue to glimmer merrily and make the ancient elms of New Haven cast fantastic shadows.

Vermont's first electric railway has gone into operation at Burlington and was patronized by 2,000 people the first day. Ex-Senator Edmunds brought a suit against the company for trespass on their opening day, claiming they have no right to occupy the street for the operation of a railway without consent of the property owners. His property borders the street in question. Here's a nice question for the lawyers to wrangle over.

His Excellency Hermann Ludwig Ferdinand Von Helmholtz.

A BIOGRAPHICAL SKETCH OF THE EMINENT GERMAN SCIENTIST.

The benevolent, noble and thoughtful countenance of a genuine genius—one who has shown by his many labors that he has in a high degree "the infinite capacity of taking pains"—is delineated in the illustration on this page. Professor Helmholtz has labored in all the vineyards of Nature, has made many branches of special knowledge peculiarly his own, and has been the originator of theories which have marked epochs in scientific progress. The field of electrical investigation has been benefited by his researches in pure science, though as he himself says, he does not claim familiarity with the practical advances of the art. Professor Helmholtz came to the United States as the Imperial German Delegate to the World's Congress of Electricians, and was made Honorary President of the Congress. Since his return from Chicago he has been honored and fêted in New York and Boston by individuals and societies as no other scientist was probably ever before honored. He leaves us with the kindliest feelings for the United States and its people. By the time these lines are published he will be on his way home to resume the duties he loves so well, and we will have the memory of the pleasant visit he made us.

PROFESSOR HERMANN LUDWIG FERDINAND VON HELMHOLTZ, HONORARY PRESIDENT WORLD'S FAIR INTERNATIONAL CONGRESS OF ELECTRICIANS.—PHOTOGRAPH BY BRADY, WASHINGTON, SEPTEMBER, 1893.

Hermann Ludwig Ferdinand Von Helmholtz was born in Potsdam, Germany, on August 31, 1821, and is, therefore, a little more than 72 years old, having celebrated his last birthday in this country. That he carries his years well is shown in an interview published elsewhere in this issue of the ELECTRICAL REVIEW. His father was a teacher in the gymnasium at Potsdam, and his mother was the daughter of a Hanoverian artillery officer of the name of Penne, a lineal descendant of the famous William Penn.

In his seventeenth year Helmholtz entered the University of Berlin as a student, and wished to devote himself to the study of physics, but circumstances compelled him to enter upon the study of medicine. He was favored in this by the liberal arrangements of the Frederick William Institute, an institution for the training of military surgeons, from which he was graduated in 1842. In 1847 he showed, in a small pamphlet entitled "The Conservation of Energy," that no energy is lost in the world, but that it alters only in its mode of manifestation. At the same time he demonstrated that all the processes of nature obey the laws of mechanics. Heat up to this time had been regarded as a "substance," but Helmholtz showed that "the phenomena of heat can all be looked upon as motion." Jacobi, the mathematician, was the only member of the Berlin Academy who at this time espoused Helmholtz's cause.

In 1851 Helmholtz astonished the scientific world by his discovery and description of the ophthalmoscope, an extremely ingenious apparatus for examining the retina in the living eye. His work from this time on contained further evidences of his genius. He made important discoveries in physics and physiology, and in 1871 accepted the chair of physics in the University of Berlin. He then was chiefly engaged in inquiries in the great departments of hydro-dynamics and electricity.

Helmholtz began his researches in the electrical field by endeavoring to determine whether forces exist acting at a distance without an intervening medium. His aim "had been to determine in what direction experiments should be made to decide between the various theories. He succeeded in making such an experiment on the electricity collected on the surface of a

conductor rotating in the magnetic field. This experiment decided in Faraday's favor." Faraday's second great problem, the relation between chemical and electrical forces, urged on Helmholtz to another series of valuable investigations. By means of the mechanical theory of heat he was able to calculate the effect of water on the electromotive force in the case of a solution of salt. He then took up the thermo-dynamics of chemical process, and solved the general problem, "What portion of the energy present in any system can be transformed into another kind?" He reached the result that all chemical compounds below their dissociative temperatures give off heat when produced in the reverse manner. The reflex effects of the ether and ponderable atoms on each other were shown in his work on "The Theory of Abnormal Dispersion." He introduced the conception of "electrical convection" in "The Transmission of Electricity by the Movement of Its Ponderable Conductors." These are but a few of the electrical researches made by Helmholtz.

In the autumn of 1887 the German Empire founded a physical technical institution, Dr. Werner Siemens having given for the purpose a sum of $125,000. The institute comprises two departments, one for purely scientific purposes, and the other concerned with the application of scientific physics to technical purposes. The first is a laboratory for the advancement of pure science. The second department has for its object to develop technical scientific methods and appliances, and to keep industry abreast of the progress of science. Over this great and important new institution Helmholtz was chosen by the government to preside, while he was further appointed director of the first or purely scientific department. In consequence, he resigned the chair of physics and the directorship of the Physical Institute of Berlin, though he still retains the position of professor ordinarius in the university, and delivers lectures on special subjects of theoretical physics. In 1883 the German Emperor conferred on Herr Helmholtz and on his family the honor of hereditary nobility. Last year Professor Helmholtz attended the meeting of the British Association at Edinburgh, and lent the support of his name to a scheme for the internationalization of the fundamental electrical units.

Turbines for the Niagara Falls Power Plant.

There has been some misunderstanding of late concerning the exact dimensions of the huge turbines to be used at Niagara Falls. To correct the erroneous impression it would be advisable to state that the turbines are properly two wheels, one above the other, each six and one-quarter feet in diameter and 18 inches high. Between the two the huge penstock comes, which is seven and one-half feet in diameter, revolving both wheels simultaneously on a tubular steel shaft three feet two inches in diameter and 147 feet high. The upper end of the shaft is connected directly with the dynamos at the top of the pit. The turbines, operated in this form, are kept balanced by the force of the water feeding them, above the bottom step or stool of the shaft, and thus there is no danger of the shaft, through friction, getting hot and burning out. In the matter of cost, in which a recent report placed each wheel at $200,000, the cost of construction complete was $50,000 and the estimated cost of each wheel in position in the pit is $60,000. Their total weight in position, including shaft, is 500,000 pounds.

The steel frame-work of the power station is now nearly completed and the hoisting apparatus, a huge electric crane, will be up during the coming week. Not much heavy hoisting will be done until the masonry on the building is up, and this will take some two weeks or more.

The electric lighting company at Windsor Locks, Conn., are putting in a 150 horse-power engine.

The Shute Memorial Electrical Fountain at Lynn, Mass.

The late William Shute, a shoe manufacturer of Lynn, Mass., who died November 25, 1891, bequeathed a sum of money to his native city to be used in some manner of public decoration.

It was decided to apply this legacy to the construction of an electrical fountain in the pond in Lynn Common. After being under construction for several months, the water has been turned on the fountain with the most satisfactory results. The fountain was exhibited on Thursday evening, October 5, in the presence of a vast congress of the people of Lynn, estimated to be at least 20,000. The fountain was formally turned over to the city by G. B. M. Houston, Esq., representing the estate of the donor, and was received by Hon. Elihu B. Hayes, mayor of the city.

The apparatus is constructed by the Franklin Electrical Company, of Kansas City, Missouri, and consists of a circular stone wall about 12 feet in diameter and six feet in height, rising in the middle of the pond like a tiny martello tower, whose parapet screens any diverging rays of light which might interfere with the full artistic effect of the brilliantly illuminated streams. The roof is below the top of the walls, and the chamber within contains seven horizontal arc lights with reflectors which project the light through the glass plates at the base of the nozzles. The wall around the fountain extends about four feet above the level of the pond in the common.

The colored glass screens can be manipulated in unison or in a great number of combinations, giving a brilliant variety of colors in changing tints and hues. In like manner the streams are readily changed to various forms, from jets reaching far into the air to a heavy spray covering the whole top of the stone work and to various combinations.

There is one central jet surrounded by four other jets, each of which has a number and variety of ajutages, throwing the water in different methods according to the will of the operator, varying from single streams to a spray which will entirely fill the circular well of 10 feet in diameter surrounding the fountain. The maximum height of the streams, as at present arranged, is about 50 feet, although there is a sufficient supply of water to project them to a greater height if desired; but as the electric wires are not yet removed from above the line of the fountain, a greater head than 50 feet has not been allowed, on account of the possible injury to the installation.

Although the effect of the application of colored lights to the water is the same as at the electrical fountains at the Paris Exposition in 1889, and at the Chicago Exhibition at the present time, yet the great variety given to the streams which are constantly changing at will of the operator, produces even more artistic results.

The pond on the Lynn Common is surrounded by a number of trees, whose deep verdure affords a finer background for these brilliant chromatic effects than the vast open spaces at Paris or Chicago.

There is to be an important adjunct to convenience and safety of the operator at this fountain, in that a speaking tube will connect this chamber to a pharmacy near by, for use in case of any communication being desired between the operator and the outside world.

The people of Lynn gather in thousands to witness the fountains, which are being operated from 6.30 to 9 P. M., and remain spellbound at the brilliancy which rivals the highest pyrotechnic effects.

Although Lynn is a city of over 60,000 population, there is a unity of public sentiment in matters of public interest rarely seen except in smaller isolated towns where some village improvement society is a "committee of the whole" of the townspeople.

It contains a park of over 2,000 acres, purchased by popular subscription, which the municipality has aided by building many miles of roadway; and there is to be another park on the ocean front secured in a similar manner.

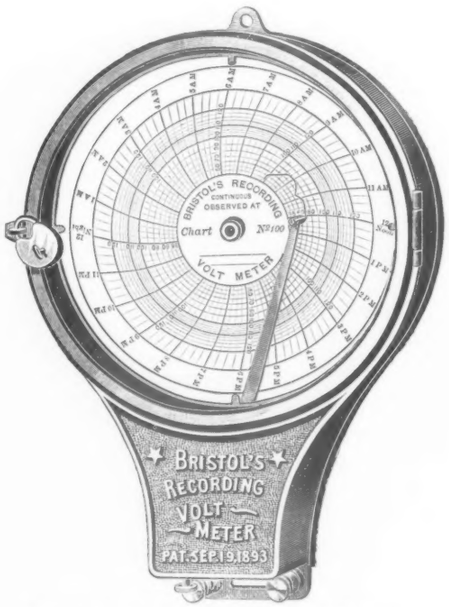

FIG. 1.—BRISTOL'S RECORDING VOLTMETER FOR 110 VOLT CIRCUIT.

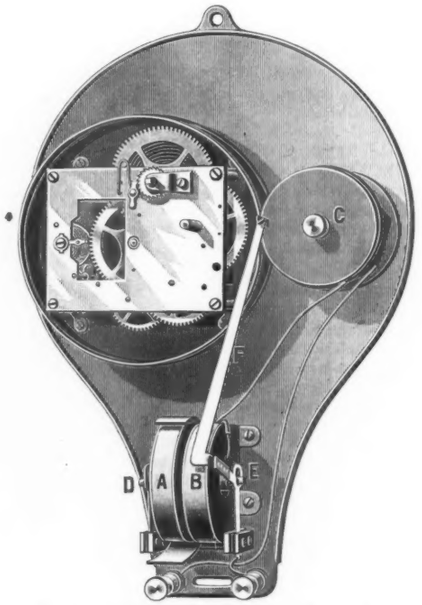

FIG. 2.—SHOWING MECHANISM OF BRISTOL'S RECORDING VOLTMETER.

Electrical Development in Atlanta, Ga.

In view of the fact that Atlanta, Ga., has been mentioned as one of the possible places at which to hold the next convention of the National Electric Light Association, the following communication from a correspondent in that city is interesting:

"The growth of the various electrical companies in Atlanta for the past few years has been very marked. This city can boast of about as good electric light, street railway and telephone service as any city. Beside these, the Gamewell fire alarm and police signal service is all that could be desired. The management of these various enterprises is such as to commend them to the public. They are all well planned, substantially built, abreast with the present needs and demands, and susceptible for addition as the city grows.

"Times have been dull and money scarce, but the electrical advantages that the people appreciate and enjoy, are fixtures and necessities that they never for a moment think of doing without. The only wonder is how the people ever did without them. Large sums of money have been expended in electrical improvements, but the outlook is encouraging for every one that has invested. Atlanta is a city with a great future. Everyone has that idea and hence she continues to grow. So far, no one has been disappointed and there are no indications that they will be."

ELECTRIC RAILWAY AND POWER NOTES.

Electric cars will probably be running to Melrose, *via* Greenwood, Mass., this week, as work on the Wakefield and Stoneham extension is almost completed.

Twelve Pittsburgh capitalists have agreed to take $300,000 of stock in the project that will tunnel Reyman's Hill, in Wheeling, Pa., at Sixteenth street. An electric line will then be run to Edgington, four miles away, throwing open 1,000 acres of splendid land which is now practically inaccessible.

There is lively talk in certain quarters of a new electric railway line from Haverhill to Chester, Mass., passing through Plaistow, Atkinson and Hampstead, thence to Chester, and from there following along the northerly shore of Lake Massabesic to Manchester. It is said that one town is ready to take $40,000 worth of the stock. If other towns interested are ready to do a similar thing, the scheme will not lack for shekels to move it. Haverhill appears to be the inevitable center for the trolley system in that section.

An electric railway is to be constructed to connect the cities of Detroit and Toledo, which will be used to transfer passengers, express matter and light freight. It will be operated by the Ohio and Michigan Electric Railway, Light, Heat and Power Company, which will organize in Toledo this week. Besides local capitalists, a number of New Yorkers and foreigners are interested in the enterprise. A part of the road is to be built this fall. The capital stock is to be $1,000,000, and it is reported that bonds have already been disposed of to a like amount. It is the intention to run trains between the two cities every half hour.

The contract for the power house of the Cataract Construction Company, at Niagara, has been let to James Stewart & Company, of St. Louis and Buffalo, the contractors for the eastern elevator at Buffalo. The power house will be of Queenston limestone, lined inside with glazed brick, and with slate roof and iron columns and braces. It will be 66 feet wide by 200 feet long by 60 feet high. The plans as prepared also contemplate the building of 200 feet additional length. The house is to be fitted with 10 turbine wheels, having a capacity of 50,000 horse-power.

More Lamp Injunctions.

The Edison Electric Light Company, last week, obtained final decrees and perpetual injunctions from Judge Grosscup, at Chicago, against the Sunbeam Incandescent Lamp Company and the Illinois Electric Lamp Company, restraining them from making lamps infringing the Edison patent.

A TALK WITH PROF. HELMHOLTZ.

THE WORLD-RENOWNED SCIENTIST TELLS OF HIS STAY IN THIS COUNTRY—HIS VISIT HIGHLY ENJOYED, AND HIS RECEPTION MOST CORDIAL AND APPRECIATIVE.

"Persistency, thou art a jewel."

If any one doubts the truth of the above remark, let him try to interview an elusive and exclusive great man who has, for the time being, put himself into the hands of his friends. The process of interviewing is not at all disagreeable to the subject in hand, and excuses have to be conjured up from the dim recesses of a highly imaginative brain to put the interviewer off the track, and thus prevent him from obtaining a much coverted conversation.

Professor von Helmholtz, official delegate from Germany to the World's Fair Congress of Electricians, who was elected president of the chamber of delegates, has finished his official duties at the White City, and has been paying flying visits to the many points of interest in the United States. His recent sojourn in Boston, where he was the honored guest of many social and scientific functions, enabled him to see quite a little of the customs and hospitalities of our New England neighbors. New York now claims him as a temporary resident, and in the sumptuous home of Dr. Herman Knapp, at 26 West Fortieth street, he is staying with his wife, the guests of the celebrated oculist. Knowing that the readers of the ELECTRICAL REVIEW would be pleased to hear some of the views of Professor Helmholtz concerning the many current topics in electrical circles, I presented myself to the dusky Cerberus who presides over the entrance to the offices of Dr. Knapp. My card was forthwith presented, and I thought I detected a sort of a hopeless look on the guardian's face as he mounted the broad staircase leading to the Professor's suite of apartments on the third floor. Patiently I sat down to wait for what I thought would be the inevitable result, and I was not disappointed in my expectations, for shortly the footsteps sounded on the stair, but it was not the Professor who appeared; it was the same person who had gone up. Then he told me, with a sort of cynical smile:

"I told you the professor wouldn't see anybody. He says he is very busy and hasn't a moment to spare."

It was no use that morning; I had to give it up, but bedecking myself with a supply of the jewels of the variety above mentioned, known as persistency, I started out to obtain an interview at any cost.

Great men, when they become the guests of our American citizens, are, as it were, shut out from the world, outside the circle of their host's acquaintances. Armed, however, with a new and gilt-edged open sesame, I procured the much-desired conversation with this eminent scientist.

Presenting my credentials, the professor received me very cordially. The time was early in the morning. The evening before the professor had been the honored guest at a reception given to him at Columbia College by President and MRS. LOW. Here he had met and talked with many of our prominent New Yorkers, and he had seen and chatted with Mr. Edison. Yet with all this dissipation from the late hours he had kept, and, notwithstanding his age, at this early time of the morning he showed no signs of fatigue.

Professor Helmholtz is about the average height, of well-rounded figure, erect in his carriage, and despite his years his eyesight and his mind are keen. His sparse gray hair brushed straight back from his high forehead, and his kindly face give him a very benevolent expression. No wonder that Ludwig Knaus produced such a fine portrait of this old man. The incentive was there, for the picture was made for the Royal Art Gallery in Berlin, and is now exhibited in the German section of the Art Building at the World's Fair; and the subject was sufficient to give the inspiration.

"I have been very busy," said the professor, "since I came back from the World's Fair, where I stayed but for a short while. As soon as my duties as President of the Chamber of Delegates were over, I spent a little while in seeing, in a very general way, the beauties of the Fair. Oh, it was very grand, but it was too big. I could not see it all."

Upon requesting the professor for his views concerning the practical advances made in this country during his life-time, the professor answered, "Oh, it is wonderful, but my opinion is not worth much, because I am a scientist and not a practical electrician. It is a mistaken idea that the people have in this country when they think that I should know all about the practical improvements in electricity, for that is not my work. I am not an electro technist, I am an electro-scientist. I have had many requests from the editors of different magazines and periodicals to write articles for them about electricity."

Here the professer picked up an imposing-looking envelope received by him that morning from a large publishing concern.

"You see," said the professor, "here's a letter from one gentleman who has asked me to write an article for his magazine, but I am too busy to write anything." Professor Von Helmholtz has, indeed, been very busy, and the many honors and ovations he has received in this country would, no doubt, be very fatiguing to anyone less robust than he.

"Yesterday afternoon," continued the professor, "I spoke to the students in Professor Knapp's class at Columbia College, and told them about my invention of the opthalmoscope. It was a very appreciative audience, as I must say all Americans are."

"Have you any photograph of yourself, professor?" I queried.

"No," he answered, "I have not now, but Mr. Brady, of Washington, who makes collections of historical portraits, took several pictures of me, and I shall get one this afternoon, but this one I will take with me back to Berlin. I must say," concluded the professor, "that my trip to this country has been very enjoyable, and I will carry to my home the fondest recollections of the many kindnesses I have received at the hands of my friends, the Americans."

JULIAN A. MOSES.

The Bristol's Manufacturing Company's Exhibit of Recording Instruments at the World's Fair.

One of the attractive exhibits in Machinery Hall, Section 25, is that made by the Bristol's Manufacturing Company, of Waterbury, Conn., as shown in our illustration. Since its establishment in 1889, this company has developed an extensive business with Bristol's recording pressure gauges and steel belt lacing. Their line of gauges is now most complete, comprising a list of over 20 different ranges from vacuum to 1,500 pounds per square inch, and adapted to record continuously, day and night, pressures of air, gas, steam, water and liquids.

The corner space occupied is diagonally spanned by an excellent imitation of a stone arch, the facing of fine leather and the stones fastened together with the company's patent steel belt lacing. To each of the stones is attached one of their gold plated recording gauges, every alternate instrument being provided with an electric light.

On one pillar supporting the arch is a gauge in operation recording the pressure of steam used in the building. On the other pillar of the arch is one of their new recording voltmeters in operation recording continuously the voltage of the alternating current which supplies the lights.

FIG. 3.—WORLD'S FAIR EXHIBIT OF THE BRISTOL'S MANUFACTURING COMPANY, IN MACHINERY HALL.

An artistic and ornamental feature is the semi-circular grille of wrought iron which fills in the arch and bears the name of the company and their specialties.

Models of the different recording instruments are arranged on tables so that visitors may examine construction. For the high-pressures a hand screw pump is provided, but for low-pressures a gauge is fitted with a mouth piece, and each visitor can operate the model by blowing. A new recording thermometer is also shown in operation, but it will not be placed upon the market until their recording pyrometer is ready. A complete line of their patent steel belt lacing for all kinds of belting is also attractively displayed.

Outside of their exhibit there are eight Bristol's recording gauges in operation at different points within the Fair grounds.

As the new recording voltmeter for alternating or direct currents has not been previously described, we illustrate the instrument (Fig. 1) complete, ready for connection, and also with front of case removed (Fig. 2), from which the extremely simple construction and manner of operation will be readily understood.

The coil A is mounted on the spring knife edge supports D and E, and free to move toward the parallel and stationary coil B, when they are mutually attracted to each other by a current passing in series. The current is conducted to the movable coil A through the supporting springs D and E, and this, together with the special feature of the moving coil being mounted on frictionless spring knife edges, renders the instrument extremely sensitive to the smallest changes of voltage. The marking arm F is attached directly to the spring E and partakes of its motion, recording the changes of voltage on a uniformly revolving chart.

It will be observed that the instrument is constructed on the electric balance principle without permanent magnets.

The divisions on the chart are on an increased scale in the vicinity of the voltage to be maintained, thereby making it possible to note the variation of one volt. The chart shown, Fig. 1, is intended for a 110 volt circuit. The coil C is an auxiliary resistance. With the alternating current voltmeter, the auxiliary resistance is furnished in a separate rheostat, which may be adjusted to suit the rate of alternations of the current to be measured.

Several of the instruments have been in use in large electric light stations for the past three months, and are giving the highest satisfaction. One of the voltmeters is on exhibition in Electricity Building. Two of them, one alternator and one direct current, are being used by the committee on awards in connection with the life tests of incandescent lamps.

A Complete Electric Plant for a Theatre.

The new Palace Theatre, of Allegheny, Pa., which was opened on Monday, August 21, possesses one of the most complete and substantial electric lighting plants in Western Pennsylvania. The entire plant was installed by the Austin Engineering Company, of Pittsburgh, Pa., and consists of a nominal 80 horse-power center crank M. A. Green automatic cut-off engine, manufactured by the Altoona Manufacturing Company, of Altoona, Pa., for whom the Austin Engineering Company are the general agents.

The dynamos are of the latest multipolar design from the Western Electric Company, and were purchased through their New York house. They run at a speed of 400 revolutions, and have a rated output of 26 kilowatts. The machines do their work in a very cool, quiet manner, and have been the subject of much favorable comment from local electricians. The switchboard, also manufactured by this company, is of white marble, on which is mounted the voltmeter, ammeters and switches, all of which are highly finished and present a very ornamental appearance. The stage regulating mechanism is mounted on marbleized slate, and all the rheostats are of the Carpenter enamel variety, and take up so small a space that it is almost impossible to make the uninitiated believe that they are "all there."

The steam plant also includes one 100 horse-power "Economic" boiler, built by the Erie City Iron Works, of Erie, Pa. The plant was installed under the personal supervision of Mr. David W. Dunn, general manager of the Austin Engineering Company, with an idea of permanence, and its substantial look is ample evidence that this idea has been carried out.

The contract of the city of Victoria, Tex., with the electric light company for the street lighting has expired. Mr. Kayer, the lessee of the plant until January 1, 1894, made a proposition to the council at somewhat higher figures than they had been getting, on the grounds that the old contract was not a profitable one. The city council refused to accept it, and the city will be in darkness until January 1, 1894, at least. This state of affairs is not appreciated by the citizens.

The Electrical Congress at Chicago.

BY PROF. SILVANUS P. THOMPSON IN THE LONDON "ELECTRICIAN."

One who sits down to review the proceedings of the Chicago Congress of 1893, and to draw an estimate of the work it may have accomplished for the advancement of electrical interests, finds himself involuntarily framing comparisons with the congresses that have preceded it. Yet if he would rightly estimate its operations at their value, he must, at least, attempt to dissociate himself from such comparisons. For, in fact, each congress is individual, not in reality bound by the decisions of any that have preceded it, and possessing no power to bind its successors. Each congress has possessed distinctive features of its own, and that of Chicago now just closed is no exception. The location, the attendant circumstances, and the internal arrangements, all differed from those of previous congresses. To begin with, it was the first and only international electrical congress held on American soil. Electrical congresses and conventions of purely local or only national scope have been held from time to time in recent years in the United States and in Canada. But at such gatherings the presence of a foreigner has been an unusual circumstance, and comparatively little importance has attached itself to any discussion or decision made. In the present case not only were many Europeans present, but the number of electricians from America itself exceeded that at any of the preceding gatherings in the States. And the congress itself received an indefinable sense of importance to Americans from the circumstance that its decisions would, in some way, bind and commit the American nation on certain questions hitherto open. The situation in the States of such matters as the decision of a congress might affect is somewhat as follows: In the International Congress, held in Paris in 1881 and 1884, America was represented. Her representatives in the former year accepted the main decision then arrived at to adopt for international purposes the British Association system of units as modified by the addition of the names of the *coulomb* and the *ampere*, and with the substitution of the mercurial column for the old British Association unit as the standard of resistance. But in 1884 when it was agreed to accept for the length of the mercurial column representing the ohm, the figure of 106 centimetres, the American representatives had been amongst the dissentients, holding that a nearer approximation to the true ohm would be made by an addition of two or three millimetres. How completely they were justified subsequent events proved. But from that day to the present the so-called legal ohm (with the corresponding volt and farad) had never been recognized by the United States Government, which had taken no steps to legalize any electrical units or standards. This is the more remarkable when it is remembered that last year the United States adopted as the legal standards of length and mass in America the actual *metre des archives* and the *kilogramme* now deposited at Paris at the International Bureau of Weights and Measures. Beyond question the leading electricians of America were prepared to act in concert with European nations. They had watched approvingly how at Frankfort the ohm of 106.3 centimetres was preferred to the legal ohm of 106. They had cognizance of the careful and anxious examination made by the British Board of Trade. They knew how at Edinburgh, in 1892, at the suggestion of Von Helmholtz, the definition of the ohm had been modified so as to express the standard column of mercury in terms of mass instead of those of cross section. All this facilitated decision, and rendered concerted action more easy. There being no governmental telegraphs in the States, no official interference could prejudice the dicisions of the congress or balk the electricians of America from accepting them. Beside the main question of securing international agreement on the fundamental units and standards, there were a few other topics of American interest. There was the proposal to christen the unit of self-induction as the "henry" in honour of Joseph Henry, its discoverer. There was a suggestion to advise on legislation as to the proper way of describing the candle-power of an electric lamp. There were proposals to name a set of magnetic standards; to settle an international notation of electrical quantities; and to decide on a practical unit or standard of light. Such was the official programme before the congress, but the unofficial programme was a much wider one. A very extensive list of suitable topics had been circulated many months beforehand, and papers invited from numerous leading electricians. Keen debates were expected upon the burning topics of the day, and several of the papers promised were avowedly written to promote discussion. Like the congresses of 1881 and 1884, but unlike those of 1889 and 1891, which were of an unofficial character, the congress of 1893 comprised an inner Chamber of Delegates, consisting of the official representatives of the several Governments. It will be remembered that, in 1881, the French Government appointed no fewer than 75 French delegates in a chamber consisting of little more than 100 members. In the present case, the United States Government appointed only five, and allotted an equal number to the three great powers, England, Germany and France, other nations having fewer. The chamber sat with closed doors, but admitted by invitation as visitors, without voting power, a few electricians, mostly German and American, whose knowledge of the subject of units rendered their presence of special value. The congress at large had, as acting chairman, Dr. Elisha Gray, of Chicago, so well known for his pioneer work in telephony and harmonic telegraphy, and lately for his telautograph. At its first assembling it elected by acclamation as honorary president his excellency Dr. von Helmholtz. It has also as presidents of its three sections Professor Rowland, Professor Cross and Professor Houston. Its general secretary was Professor Crocker, who, unfortunately, was only so chosen after the meeting of the congress. Had he been appointed beforehand much valuable time that was wasted on preliminary arrangements would have been saved. And here a word of explanation as to the loose character of the arrangements made for the accommodation of the congress may be recorded. Had the electrical men of the States held the control of affairs, no doubt the whole, from first to last, would have been carried through in a business-like way, with efficiency, and dispatch, and method. But, unfortunately, since the congress was supposed to be in some way connected with the World's Fair, the work of preliminary preparation was committed to a semi-official organization known as the World's Fair Congress Auxiliary, presided over by an utterly incompetent and fussy official of the name of Bonney, who sought to magnify his office by calling together in Chicago no fewer than 150 different congresses on all topics, from religion to piano-tuning. Of these there was a large number going on every week; the Electrical Congress week witnessing also Congresses on Astronomy, Spiritualism, Africa, Chemistry and Freemasonry. Persons accustomed to the good organization of the meetings of the British Association were horrified to find conspicuous by their absence all such features as the daily programme, the reception room, the printed list of members, and the like. The list of papers to be read (not in their order), though prepared on the Friday evening for the press, was not ready for distribution till Tuesday. The rooms chosen both for the general session and the section meetings were intolerably noisy, opening upon a busy station of the Illinois Central Railroad. And no provision was made for securing proper reports. The daily newspapers of Chicago city made no efforts to give useful reports, and sent reporters destitute of any technical competency, who merely chronicled trivial personalities. On the other hand, great efforts were made by the proprietors of three leading technical electrical journals to produce reports of the congress with promptness. Such alertness on their part made the incapacity of the daily papers seem even more glaring. This congress, the only official one of all the series, was treated as though it had no more significance than a congress on chess-playing. It was entirely ignored by the municipality, and by the prominent citizens of Chicago. If it had not been for the personal exertions of Dr. Elisha Gray, of Professor Carhart, and of some of the more active members of the American Institute of Electrical Engineers, who at an early date took an active part in foreshadowing the arrangements to be made, the whole thing would have been a melancholy fiasco. Englishmen knowing the difficulties which their American brethren may have to meet from the incompetence of officials who owe their appointments to political influences, can make allowances. What their continental brethren may have thought of such a discreditable state of things may be imagined. After the opening session of the general congress, with its speeches of welcome, sectional meetings were held. Section A, on topics of theory under Professor Rowland, met next morning only to adjourn, being unable for that day to discover what business there might be for it to transact. Sections B and C, which were respectively devoted to mixed theory and pure practice, were more fortunate, and held active sessions each morning, and were attended by considerable numbers. The chief discussions, some of which had to be adjourned, were on the subjects of Long-Distance Transmission of Power, Multiphase Motors, Phenomena of the Arc, and Ocean Telephony. Professor Ayrton's paper on the arc will probably be the most enduring in note of all the papers read. Mr. Preece's account of his experiments on telegraphing without wires was also well received.

The Chamber of Delegates, under the presidency of Professor Rowland, of Baltimore, met usually in the afternoons. It set to work first upon ratifying the fundamental electrical units in such form as to meet with international agreement. There was little dissension as to the actual end to be arrived at, but much discussion as to the form. After it had been agreed to adopt as the international standard of resistance the mercury column ohm 106.3 centimetres in length, there arose a prolonged wrangle as to whether this should be taken as a primary standard or not. Professor Mascart desired that this material standard should be decreed to be the ohm without any reference to the centimetre-gramme-second system of units from which it is supposed to be derived; just as the international meter is defined as a certain bar of platinum without reference to its supposed relation to the quadrant of the earth's meridianal circumference. On the other hand, Professor Mendenhall strongly urged that the abstract definition as 10^9 in the C.G.S. system should be retained. Eventually, by the appointment of a small sub-committee to settle the wording, a compromise was arrived at, which leaves the definition in entire accordance with that already accepted in England, Germany and France. Similarly, with the definitions of the ampere and the volt, compromises were finally voted with unanimity. It was curious to note that M. Mascart, who had stood out on the ohm as the champion of the material standard, advocated equally succinctly the definition of the ampere as an abstract unit without reference to any material way of reproducing it, whether by silver deposit or by some standard gravitational amperemeter or electro-dynamometer. M. Mascart denied the precision of the silver deposit, and was supported by his excellency Von Helmholtz. Professors Carhart and Rowland equally impugned the possibility of getting an absolute reading correct to one part in 10,000 by either electro-dynamometer or by tangent galvanometer, unless in some special research of extraordinary precision. Then the question was raised whether, supposing the ampere should be defined only in terms of the ohm and volt, the latter could be more accurately defined in terms of absolute value than the ampere could be. It was urged that Clark's cells could be made easily to agree to within one part in 10,000 to one another. On the other hand, it was doubted whether the absolute value of the cells so agreeing with one another was determined with anything like that accuracy. It was pointed out that the congress of 1881 defined first the ohm, then the volt, and took the ampere as the mere sequence of these two. Was it well now to reverse the order, and define the ohm and then the ampere, leaving the volt to be defined in terms of that pair of units? Of course in the abstract relations of the C. G. S. system the order was immaterial; but M. Mascart's proposition was to define the ohm in the concrete and the ampere in the abstract; which would necessitate a definition of the volt as that electromotive force which would send the abstract ampere through the concrete ohm. Eventually these matters were referred, as the ohm had been, to the small sub-committee to frame language, and its report, moved by Prof. Mendenhall, and seconded by Dr. Budde, was unanimously adopted. It defines each of the units as an abstract quantity, but adds in each case the practical standard by which in the present state of science the unit may be sufficiently closely represented for legal purposes. To distinguish these units as now defined from the definitions given by previous meetings or congresses, they are denominated the "international" ohm, the "international" ampere, etc. The wording of the schedules in which are to be described the details of the processes of silver deposit for the ampere, and of construction of Clark's cells, was relegated to a sub-committee consisting of Professor Von Helmholtz, Professor Carhart and Professor Ayrton. The definitions of the farad, the coulomb, the joule, and the watt were accepted without much debate, as the logical consequence of the three units first decided. Over the proposal to recognize the "henry" as the unit of self-induction there was much discussion. Everybody appeared to be willing to agree to the proposal to adopt the name of "henry" (in honor of Prof. Joseph Henry) in place of the impersonal (and incorrect) name of "quadrant," selected by the congress of 1889; but no one seemed to be quite ready to define the quantity to which the name was to be attached. It was pointed out that mutual induction must be expressed in terms of the same unit as self-induction. Eventually, an understanding was arrived at. M. Mascart moved, and Professor Ayrton seconded, the adoption of the name "henry," whilst the exact definition was referred to the sub-committee. The new definition of induction cleverly turns the difficulty that is involved in any attempt to take into account the magnetic properties of the medium, and reconciles the two opposing views. Then came up for discussion the question of the proposed magnetic units. Should the C.G.S. system simply be adopted? Or should a "practical" magnetic system be approved having the 10^8 as a factor in it to correspond to the volt? And what should be the names given to such units? Professor Rowland objected to any extension of the "practical" system with its eighth and ninth-power exponents, into the magnetic part of the subject; urging as one reason, that the designers of electromagnetic apparatus do not use anything except the C. G. S. system. He also objected to multiplicity of names. Some attempt was made to secure the adoption of the name of "gauss" for the C. G. S. unit of magnetic field, it being alleged that for want of some such name incorrect designations were sometimes given; as, for example, where the horizontal component of the earth's field is described as being 0.18 *dyne*. A majority of the delegates failed to see the force of this argument. It was moved by Mr. Siemens, and seconded by Professor Nichols, that the C. G. S. units of magnetism be adopted without names, and this was carried. The question of the scientific designation of the brightness of electric lamps was then introduced. What was a 1,000 candle-power lamp? Was it one that only measured 1,000 in one particular direction? It appeared that certain American contractors, not of the first rank, had been in the habit of describing a certain kind of arc lamp as of 1,000 candle-power, which, in fact, was far from being such. The law being apparently powerless to deal with such frauds in the absence of any recognized definition of candle-power, decision was asked on the point. It was suggested that lamps should be defined in terms of watts, not of candle-power. American delegates protested that this would not protect the consumer from having imposed upon him an inferior lamp, which, for the same number of watts, gave less candle-power. It was pointed out that under the British electric lighting acts the undertaker cannot prescribe to the consumer what sort of lamp he must use, and leaves the consumer free to use any lamp that is adapted to the declared pressure or current. It was eventually decided that the difficulty being a purely national, and not an international one, arising mainly out of the circumstance that American municipalities have not yet adopted the wholesome practice of calling in some responsible consulting engineer to advise them upon the terms in which their contracts should be drawn up, the congress could not interfere. But the discussion served to emphasize the uncertainties which exist in the absence of working methods of measuring color and of a suitable integrating photometer.

Two other questions, which were referred by the chamber to the sub-committees, received anxious consideration, and were keenly discussed before being reported upon. One of these was the proposal for a system of uniform notation; the other related to the standard of light. The array of symbols proposed by M. Hospitalier was championed by him with ability and eagerness, and was with some amendments adopted by the sub-committee and received by the chamber (but not for official adoption) and ordered to be printed. Some of its details seem open to severe criticism, but if only they could be universally adopted how convenient they would be! The proposal of Drs. Budde and Lummer to adopt as a standard of light the Von Hefner lamp, with its reddish flame of acetate of amyl, was no less emphatically urged. There was no other practical lamp of equal constancy—within two per cent.—and the molten platinum standard was not realizable; then why not adopt it as the standard? It required much backbone on the part of the English, French and Swiss representatives to resist the vehement plea. But, with the possibility of a simple and better electric standard looming in the near distance, giving a really white light of fixed brightness as a standard, it was clear that no proposal for a flame standard would be acceptable, and certainly not this amyl-acetate flame, however excellent may have been the results obtained at the Reichsanstalt. And so the sub-committee, under the presidency of M. Violle, arrived at the inconsequent conclusion that they were not able to report in favor of any standard at present.

All too soon the five days of the congress came to their end, and the final meeting was held to announce the decisions arrived at, and to thank our American hosts for the courtesy and hospitality with which they had received their guests. Dr. Elisha Gray, in finally responding with characteristic simple dignity, thanked all members present for their help, and begged those who came from foreign shores to Chicago not to think only of its smoke and noise and tall buildings, but of warm hearts praying that they might have smooth seas and a warm welcome home. And so with the inevitable accessories of photographs of groups, of a festive banquet, of a reception by the British Commission, of midnight speeches at the Electricity Building, and of newspaper portraits mainly of celebrities who never came near the meetings, the Chicago Congress vanished into the past.

The Street Railway Convention at Milwaukee.

The *Street Railway Journal* has issued a circular, under date of October 5, announcing that arrangements have been completed for special transportation to the twelfth annual meeting of the American Street Railway Association, to be held in Milwaukee, Wis., October 18–20, 1893, *via* New York Central and Hudson River Railroad, from the Grand Central Station, New York, at 1 o'clock P. M., Friday, October 13, 1893, arriving in Chicago next day at 2 o'clock. The train will be composed of Wagner vestibuled sleeping cars, with dining car attached. The fare for the round trip from New York to Milwaukee will be $43.60, adding $5 for berth each way to and from Chicago.

This rate applies to those starting from New York. Special rates will be given to those joining the party *en route*. The object of leaving at this time is to enable the delegates to spend two or three days at the World's Fair before attending the meeting, and likewise after the meeting, if desired, thus making an agreeable break in the labor of sight-seeing at the Fair. In order to be provided with accommodations on this train, it is necessary that the amount for the ticket from New York ($48.60) should be sent at once to T. E. Crossman, American Street Railway Association, 166 Montague street, Brooklyn, who will assign berths and send tickets.

Search-Lights and Torpedo Boats.

During the past summer experiments have been made in the harbor at Newport, R. I., to determine upon measures to be employed by torpedo boats to escape detection with search-lights. The "Cushing" has been the boat in use, and much progress has been made. The torpedo boat at no time used both her boilers in steaming about, and, consequently, did not run as fast as she might. She was tried painted in several colors, but was discovered until a dull green hue was used. Then she ran into the harbor before the powerful search lights of the cruiser "San Francisco" and monitor "Miantonomah," as well as the big light at the torpedo station, could detect her. She got within a few feet of each of the war vessels, and in a fine position to do great damage with her torpedoes. One night last week the "Cushing" entered the harbor, and although both vessels were looking for her, she passed completely around the island, on which is the torpedo station, twice without being detected. These experiments are said to be more successful than any carried on in the same line by any nation. The green appears to be the proper color for torpedo boats. In the glare of the search-light it is quite like water. At times it resembles the moss-grown rocks.

A Trolley Road Equipped and Operated in Twelve Hours.

It is reported that the Newark and South Orange, N. J., Railroad Company equipped and ran its first car to South Orange by electricity last Saturday morning, scarcely 12 hours after the South Orange Board of Trustees had unanimously passed an ordinance granting it that privilege. There was a rumor that Village Counsel James McC. Morrow, ex-Village President Edward D. Self, Edward D. Shepherd and others were to get out an injunction to prevent the running of the cars, so the railroad people put a gang of 300 men to work Friday night as soon as the ordinance passed. Poles were erected, wires strung, and the current turned on at 10:40 o'clock Saturday morning, when the first car was run to the South Orange terminus, conveying railroad and village officials, and announced by the ringing of bells and the discharge of cannon.

An Open Chance.

The North Granville Seminary, North Granville, N. Y., J. C. M. Johnston, principal, has an Electrical Department. There is a vacancy at the present time for a teacher in this branch. Any one desiring this position should write to Professor Johnston at the above address.

EUROPEAN ELECTRICAL NEWS.

Recently M. Hanemann, a well-known Russian engineer laid before the Minister of Public Works, at St. Petersburg, a plan of tunneling the Neva. According to the *Revue Francaise* the tunnel is to be circular, its diameter being 12 m. and its length 185 m. Altogether the tunnel would much resemble that under the Thames. M. Hanemann intends a four story construction, the upper one containing ducts for electric wires, the second contains a passageway for pedestrians, the third a wagon road, and the fourth is to be used for rapid electrical transit.

The proposed hydro-electric installation of Anvers is rapidly progressing. Our readers will doubtless remember that M. Van Rysselberghe was deeply interested in this matter; in fact, it wholly engaged his attention during the last few years of his life. According to the agreement between the city and the contractors they must at once lay eight kilometres of hydraulic conduits and 16 kilometres of electric conduits. The resistance of the conductors must not exceed 0.20 ohms per kilometre. The first hydraulic station is expected to supply 500 horse-power, and must be able to send 75 litres per second into the conduits under a pressure of 59.5 atmospheres. M. Van Rysselberghe's argument before the municipality in favor of this novel enterprise deserves attention. He stated that twelve 16 candle-power lamps require one horse-power; but as one horse-power hour necessitates the expenditure of one kgm. of carbon, the cost of carbon used per lamp would be 0.13 centimes, while the price of gas for a burner giving the same amount and quality of light would be five centimes per hour. He then asked: Why is it that our electricians cannot furnish electricity cheaper than gas? The reason for this condition he said was the loss of energy during transmission; suppress this loss and electric light can be furnished cheaper than gas. His argument carried conviction. The Antwerp Company will charge 0.85 francs per kilowatt hour, and 0.45 francs per meter cube for water under a pressure of 47.5 atmospheres.

The Inventions of Jones.

"When you are quite done with this kindergarten business," said Jones, "I will tell of the Centennial Runaway Paralyzer and Conservator of Force. It was a little invention of my own for use in connection with my horse Sir Landslide. The Griswold Controller worked well, but I saw a loss of force which annoyed me, as I did when I conceived my tramp and cat motors, and my Morning-Star Milker, operated by the motion of the cow's jaw in chewing her cud. In the Centennial Paralyzer and Conservator I had recourse to a dynamo and storage battery under the carriage seat. Beneath the carriage and near the ground I had swung a tread-mill track which could be extended out in front like the gang-plank of a steamboat. Hitching up Sir Landslide, I would start out as usual. At the sight of the first telegraph pole, baby perambulator, umbrella, or other object which in his judgment furnished a sufficient excuse for running, he would start. When he got well going I would run forward the track under his feet, and he would find himself standing still, though running with all the fierceness of his vicious nature. My dynamo, propelled by the flying track under the feet of Sir Landslide, would revolve with lightning-like rapidity, and I would divert a part of the force to propelling the carriage, and would jog along at the rate of six miles an hour with my horse going at the rate of 25. The noise of the machinery excited him a good deal, and he would often run for two hours, leaving me with enough power in my storage battery to propel my carriage for a week. People used to come for miles to see me take a quiet morning drive with Sir Landslide and the Paralyzer and Conservator."—*Harper's Weekly.*

TALKING TO CHICAGO.

Professor Von Helmholtz Witnesses a Test of the Long Distance Telephone.

On Thursday evening of last week there was given, at No. 18 Cortlandt street, the offices of the American Telephone and Telegraph Company, a unique test of the value of the long distance telephone.

Professor Von Helmholtz had been invited by Professor Bell to converse with people in Chicago, Boston and Washington. At five o'clock the lines were opened, and about 20 receivers were supplied for the convenience of the visitors present.

Professor Helmholtz took the chair and Professor Bell introduced him to Mr. Hudson, the president of the Long Distance Company, who was in Boston. Mr. Hudson declared that his German was a trifle rusty, so Mr. Berthold, who was at the Boston end of the line, made a few inquiries concerning the successful operation of the circuit. Professor Helmholtz declared that he heard perfectly. A cornet was played at Cedar street in this city, and those present in Boston and in New York heard the clear and resonant tones as they issued from the loud-speaking receivers. The one at this end of the line was hung near the ceiling, and the issuing sounds were distinctly audible in the adjoining rooms with the doors closed.

As the loud-speaking receiver's tones were heard by Professor Helmholtz, a pleased expression came over his face, which showed that it was hard for him to realize that a person in Boston was whispering into the transmitter so low that those within a couple of feet of him could not hear his voice, yet here were we, about 250 miles away, listening to his words spoken from the mouth of the receiver to which was attached a large trumpet. The volume of the sound filled the room.

LONG DISTANCE TELEPHONE COMPANY'S SOUVENIR.

Professor Langley and the German minister at Washington next spoke to Professor Helmholtz, who regretted that he had not seen Professor Langley at the Smithsonian Institution while he was in Washington.

Communication was next made with Chicago, and the professor found as much difficulty in understanding English over the telephone as did those who couldn't speak German when German was spoken. However, he was very well pleased with the working of the line, and so expressed himself.

Among those present were Professor Von Helmholtz, Professor Rood, President Low, of Columbia College, Dr. Hermann Knapp, Prof. Alexander Graham Bell, Messrs. E. J. Hall, F. A. Pickernell, Colonel Meany and Julian A. Moses, ELECTRICAL REVIEW.

All present remarked on the wonderful facilities thus presented for almost instantaneous communication with cities so far apart. A souvenir of the occasion, a sketch of which is shown herewith, was given to each visitor upon his departure, consisting of a section of wire used in the construction of long distance telephone lines.

Loss of Electricity in Daylight.

Some recent experiments have been made in regard to the loss of negative electricity by the action of very refrangible light. The radiations employed in these experiments were those of the voltaic arc, rendered very active by the volatilization of zinc or aluminum. I have myself shown that by the action of these radiations, all the metals, polished or not, varnished or not, manifest the loss of negative electricity. The positive loss was less important. The solar light and that of the clouds exercised insensible action only. New experiments have proved to me that the loss by the light of day may become very considerable, with the usual metals, aluminum, zinc, cadmium, if the negatively electrized conductor has just been polished. My observations were made with a gold leaf electroscope, the gold leaf being enclosed in a cage entirely metallic. A disk of aluminum was placed on the button of the electroscope in a well-lighted room. A brightly polished disk, if the polishing had been done some days before, acted nearly like any metal whatever, whether polished or not; but if this disk of aluminum had been just brightly polished (polished in turn with emery paper and a drop of essence of turpentine), the collapse of the gold leaf was rapid even with diffused light. The discharge of the electroscope was soon complete. In this case the active light was that which had passed through the panes of glass of the room in which the experiments were made. The loss of electricity diminished in proportion to the distance of time from the moment at which the polishing had been done. A disk of aluminum freshly polished, exposed to the blue light of the sky, at an open window, away from the direct action of the solar rays, lost all the charge of the electroscope in seven seconds; with a disk of zinc 20 seconds were necessary, and 65 seconds with a disk of cadmium. In the fine days of the month of April this year, it required but two seconds for the total loss of electricity with aluminum and the loss by zinc and cadmium was also more rapid. The discharge was very active under the action of the direct solar rays, but less active when the sky was clouded.—EDOUARD BRANLY in *Journal de Physique, Théorique et Appliquée, Paris.*

A Multiphase Transmission Plant at Concord, N. H.

A valued correspondent of the ELECTRICAL REVIEW writes that the Concord, N. H., Land and Water Power Company has the proud distinction of being the first in the United States to install and operate a commercial plant of the same character as the one used in the experimental tests between Lauffen and Frankfort, Germany.

A short time ago there was started at the station of this company a 35 kilowatt "three-phase generator," made by the General Electric Company. The entire day load for the incadescent, arc, heating and cooking circuits and several "three-phase" motors was thrown on and operated without trouble of any nature.

The generator delivers 1,100 volts to the primary wires which are transformed, at a ratio of ten to one, to 110 volts on the secondary circuits, with a frequency of 6,000 alternations per minute, as against the previous use of 16,000 per minute; this low frequency does away with the noise theretofore produced in the cooking apparatus as operated on the alternating system, an advantage that will be appreciated by the consumers. It is the intention of the company to install now, two 250 kilowatt "three-phase" generators at the power station at Sewall's Falls and ultimately to put in six of them.

These generators will be about 12 feet long and eight feet high, and are to weigh about 15 tons. These will furnish current for incandescent and arc lighting, motors, and cooking and heating.

At Sewall's Falls the company has one of the very best dams in New England, 500 feet long with a 22 feet head and a normal average capacity of 5,000 horse-power. There are now in place four pairs of turbines of a capacity of 400 horse power to each pair, a total of 1,600 horse-power, and eventually there will be five pair, making in all 2,000 horse-power to be used for generating electricity.

A much to be desired advantage of this system is that the machines are all alike, so that any one of them may be used for any required purpose, thus doing away with so many different dynamos and the necessity of duplicating them to provide for a breakdown.

The citizens of Concord will congratulate the managing officials of the Concord Land and Water Power Company on their foresight in securing the best apparatus, and that which is destined to be the "coming thing," and will appreciate the efforts of Mr. Eugene F. Carpenter, under whose direct supervision the plant has been so successfully installed.

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Barrett, John A., electrical engineer	viii
Berlin Iron Bridge Co., iron roofs and buildings	v
Brill Co., J. G., tramway cars	vii
Brown Electric Co., cleat	vi
Brush Electric Co., apparatus	ix
Buckeye Engine Co., engines	vii
Butler Hard Rubber Co., battery cells	iv
Case Engine Co., J. T., steam engines	viii
Clark Electric Co., arc lamps	viii
Columbia Incandescent Lamp Co., incandescent lamps	vi
Cutter, George, electrical supplies	vi
Denver Highlands Electric Co.	96
Dixon Crucible Co., belt dressing	vii
Edison Decorative and Miniature Lamp Department, incandescent lamps	96
Electric Construction and Supply Co., Ward arc lamps	iii
Electric Selector and Signal Co.	iv
Electro-Light Engraving Co., engraving	96
Equitable Life Assurance Society	96
Falls Rivet & Machine Co., friction clutches	v
Fidelity Carbon Manufacturing Co., carbons	iv
General Electric Co., multipolar transformers	iii
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Greeley & Co., The E. S., supplies	iv & v
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Helios Electric Co., arc lamps	v
Holmes, Booth & Haydens, insulated wire	vi
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Lehigh Valley Creosoting Co., creosoted lumber	96
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New York Belting and Packing Co., rubber belts	ix
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Western Electric Co., supplies	ix
Weston Electrical Instrument Co., measuring instruments	vi
White Dental Mfg. Co., acid gravity battery	viii
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Insurgents, rebels, strikers, renegade Indians, wild Moors and many other classes of law breakers are getting rapidly educated in modern ways. They have all learned that when an outbreak of any kind is contemplated, the first thing to be done is to cut off electrical communication between the scene of trouble and the rest of the world. In one of our Indian wars one bad Indian made more trouble than a thousand others, simply by riding along and cutting telegraph wires. It is now reported that the unruly Moors have cut the cable connection between Melilla, Morocco, and Madrid, Spain.

The ramifications of the long distance telephone are becoming more numerous every day. The latest addition to the net-work is the new line between Spokane, Wash., and Everett, by way of Portland, Ore., some 800 miles in length, is the second longest line on this continent. Evidently the business communications and relations between these two cities warranted the installation of this expensive line, otherwise its existence would be *non est*. As it now stands, this new line speaks well for the enterprise of these western cities, and the telephone people are not slow to recognize the prospective value of stations for termini of their valuable long distance lines.

Welding rails by electricity has become very nearly a practically successful process. Strange as it may seem, the expansion and contraction of the iron rails is not an element of failure. The old story told to the school boy, regarding the co-efficient of expansion of iron, viz., "How many feet would the tracks of the New York Central Railroad run into Albany in case there was a raise of 10 degrees in temperature, provided there were no spaces between the ends of the rails?" would now be entirely out of place, for the bulging of the rails, held fast by strong spikes, is sufficient to compensate for the increasing and diminishing lengths. In case a soft rail is found, it is simply sawed out and a new one welded in its place. When joints are abandoned the constant and annoying clicking, caused by the wheels passing from one rail to another, will be avoided, and travel on our best roads will have added to it an extra pleasure.

SOME DATA CONCERNING THE ELECTRICAL INDUSTRIES OF CHICAGO.

The seventh biennial report of the Bureau of Labor Statistics of Illinois has been issued during the last week, and may well claim the attention of the electrical manufacturing companies throughout the United States. So far as we are aware this is the first time that accurate statistics have been published of the wages paid to women employed in electrical industries.

Four hundred women are employed in Chicago as telephone operators, their weekly wages ranging from $5.50 to $8, advancement being according to merit solely. The commissioner states that "the work is clean, exacting, but not laborious, and essentially confining, the operators not being permitted to leave their seats during duty hours.

"The novelty of talking daily at arms-length to hundreds of people of all sorts and conditions soon wears off, and the experienced attendant finds answering calls and listening to impatient remonstrances from her patrons a mere matter of routine, utterly devoid of personal interest. No girl is employed by the company who is under 18 years of age." The statistical tables show that the telephone girls are among the *best* paid of all operatives, having average weekly earnings of $7.13, and there are only four groups which have a better average. The yearly record was obtained of 105 who worked a full year, and the average of the earnings of these was $362, with an average of 14.3 days lost time.

Coming to "Electric Supplies," a title which is quite misleading, as the information given under the above heading relates merely to insulated wire manufacturing establishments, the report states that the girls work nine hours per day at weekly wages ranging from $7 down to $4, while the average pay is about $6 per week. "It is light work, the pay compares favorably with similar employment, and the girls appear to be satisfied with the conditions under which they labor." The average weekly pay of 270 girls in this kind of work is $5.78, those earning more and less than the average being, respectively, 57 and 43 per cent. of the whole. Annual earnings average $302, with an average loss of 24.3 days in the year. The expression "Insulator," employed by the report to denote "girls employed in the manufacture of insulated wire," is novel, and might lead to amusing mistakes. The name should be changed. The only other electrical industry represented in the report is the telegraph. We learn that the telegraph company of Chicago employs over 200 women as operatives. The highest salary paid is $60 a month, the lowest $35, and the average about $45. The commissioner pointedly remarks that "this is all the information that could be obtained from the manager of this company. Personally he was not unwilling to give the Bureau the information sought, but his instructions forbade giving information to any one regarding employés unless *compelled thereto by law*. The superior officer of the line was appealed to in vain. What hours the operators work could not be learned, nor anything regarding their system of "subbing." It is to be regretted that the Bureau did not instruct their collectors of industrial statistics to visit electric light and power establishments. Much valuable and interesting material has thus been overlooked, but we hope that the next report of the commissioner will give such additional data. Altogether we congratulate Mr. John S. Lord, the secretary of the Illinois Bureau of Labor Statistics, upon this valuable contribution to the history of American industries, and especially of the electrical industries of the State of Illinois.

There are very few factories operated with a smaller loss of power than 30 per cent., occurring while the engines are running, whether work is being performed or not. A proper system of electric power transmission will save at least half of this loss, and many large shops could save the cost of an electrical plant in one year.

LETTERS FROM A LABORATORY.—LXVI.

BY JULIAN A. MOSES.

Confidence is the mainspring of action in all business dealings done on credit, and, as the major part of our transactions are performed on credit, it is essential to success that a stability of public and individual confidence be established.

The present unsettled condition of this country's finances may be directly traced to the lack of confidence. In all businesses should this feeling of mutual security exist. Young industries should not suffer more than the older ones. It would be radical injustice to them to have a decided distinction made. It is true that the older industries may have proven themselves more worthy of confidence, and it is very possible that it is this rule of business, contrary to established social precedent, which has been made to read: "Always treat a man as an enemy until he has proven himself a friend." This statement on the face of it shows an existing lack of confidence, and it is to be lamented that it does exist. No industry is free from this, and the electrical business is quickly coming into the line and producing its quota of business skeptics.

One may state almost positively that honesty is the mother of confidence; and such being the case, all inducements should be made to have honesty as prolific as possible. Individual honesty means in the aggregate public confidence, and it should be the aim of all public-spirited citizens to start weeding at the bottom, and thus get down to the very root of the evil. This can only be done by employing rigorous measures, such as the ostracism of those who are unfair and underhanded in their dealings.

The contractor's business is one peculiarly susceptible to these conditions, from the manner in which the bids are made and the ofttimes serious difficulties which preclude the possibilities of procuring exact estimates from the outset.

A case in point is well worthy of mention, as showing how, by underhanded means—means obviously against all established rules of business—the unprincipled may obtain contracts which are entirely of no pecuniary benefit to them, yet advantageous simply as a possible means of procuring more work:

A certain business man made known to a friend the fact that he desired his store wired for incandescent lighting. This was communicated to one firm who did contracting for electrical installations, who forthwith proceeded to and did make a bid on the work. This contract was not the only one submitted, for another contractor, whom we will call, for the sake of convenience, Mr. A, hearing of the work to be done, put in his estimate, which, also for the sake of convenience, we will say, was $2,000. These estimates were duly considered, and much to the merchant's surprise he found one to be twice the amount of the other. Thinking that there must have been some mistake, out of consideration to Mr. A, he went to that gentleman and told him that his bid was exhorbitantly excessive, and that it amounted to more than double that of the other contractor.

With a great show of regret Mr. A signified his sorrow at being unable to obtain the contract, and the merchant returned to his office feeling sure that Mr. A was either very unwise or that he did not know his business. Resolving to give the work to the contractor who made the first bid, imagine his surprise when he reached his place of business to find that a third contractor awaited him, and this man made a bid of, say, $900, less than one half of Mr. A's original bid. This bid was accepted, but in common justice to the first contractor, who made his bid honestly, the work should have gone to him.

There was only one person who could have told the third bidder of the proposed contract, and that person was none other than Mr. A.

Here then was a case of where underhand dealing lost much business for this contractor, for when it was discovered that it was he who had betrayed the confidence of the merchant, who had considerately informed him of his excessive bid, and told a competitor, by whom probably he did not lose much immediate gain, no more business came his way from that merchant and his numerous acquaintances.

This incident is an apt illustration of how it is possible for both an excess and an insufficiency of confidence to undermine and destroy mutually beneficial business relations.

ITEMS OF INTEREST.

The towns of Buxton, Hollis and Standish, Mass., are to be asked to contribute to the building of an electric railroad.

An extension of time has been granted to the Lynn and Boston railroad by the selectmen, for putting the trolley system to Wenham and over the Beverly and Danvers branch. Both branches will be in running order by July 1, 1894.

"One of the most ingenious devices for a ball room decoration which has recently appeared," says London *Lightning*, "is the invention of Mr. Thomson, of the Craigmillar Ice Factory. It consists in the freezing of incandescent lamps into large and prettily-shaped blocks of ice, which would serve the double purpose of giving forth coolness and light."

On October 2, the last connection was made on the long distance telephone line between Spokane, Portland and Willamette points, Tacoma, Seattle and Puget Sound points, thus completing one of the longest telephone lines in the world, involving an outlay of nearly $250,000. The main line is 750 miles long. The wire is No. 10 and the poles are from 30 to 65 feet high set six feet in the ground.

The Sacramento, Cal., Electric Power and Light Company has closed a contract with the General Electric Company for furnishing the material and erecting the plant for transmission of power from their works at Folsom to that city. The specifications cover the three-phase system of the General Electric Company and the two-phase system of the Westinghouse Electric and Manufacturing Company. Cut-out stations will be placed at convenient points, where the line may be cut out, grounded or cross-connected. The wires will be suspended 30 feet above the ground on 40-foot poles. The work must be completed within 10 months, otherwise a forfeit of $50 per day overtime will be exacted. This project is one of the best that could have been devised for the commercial and manufacturing interests of this city. There will be almost an unlimited supply of electric power, and this being much cheaper than steam, will stimulate manufacturing enterprises enormously.

An Incident.

While it was not an amusing occurrence, it was interesting; it seemed as if the whole population of the surrounding districts had turned out to see the sight, and it was an impromptu performance too. In less time than it takes to relate, policemen stood at every corner, ambulances had been summoned, had arrived and were waiting for expected victims. Fortunately there were no accidents, but the crowd was frightened just the same. The cable car had run amuck once more, and a broken strand was to blame. Along the crowded thoroughfare it bowled, six other cars in front of it going at their utmost speed, with conductors, gripmen, policemen and running newsboys shouting at the top of their voices to pedestrians and drivers ahead of them. When one of the cars reached the power house at Houston street, then and only then was the snaky cable stopped in its destructive gliding.

There were no means of communicating by telephone, telegraph or other electric apparatus with the power house, and the mighty engines kept up their revolutions until the engineer was communicated with by word of mouth. With such a thing as the cable car system in existence, it is obviously necessary to have electrical means for communicating with the source of power.

If communication directly with the cars cannot be obtained, some signal apparatus should be placed at every corner. The cable conduit itself is an excellent conduit for whatever wires they might choose to lay; and if this company has any regard for the security of the public, we can see no reason why some steps should not be immediately taken towards supplying signal boxes. The public should demand it if they are not immediately forthcoming.

A Piezo-Electric Pile.

At the recent meeting of the British Association Lord Rayleigh read a paper by Lord Kelvin on the above subject. He said the application of pressure to a voltaic pile, dry or wet, had been suggested as an illustration of the piezo-electric properties of crystals, but no very satisfactory results had hitherto been obtained, whether by experiment or by theoretical considerations, so far as he knew. Whatever effects of pressure had been observed had depended upon complex actions on the moist, or semi-moist substances between the metals and electrolytic or semi-electrolytic and semi-metallic conductances of the substances. Clearing away everything but air from the opposed metallic surfaces of different quality, he had made the piezo-electric pile which accompanied the communication. It consisted of 24 double plates, each eight centimetres square, of zinc and copper soldered together, zinc on one side and copper on the other. Half a square centimetre was cut from each corner of every zinc plate, so that the copper square was left uncovered by the zinc at each of its four corners. Thus each plate presented on one side an uninterrupted copper surface, and on the other side a zinc surface, except the four uncovered half-square centimetres of copper. A pile of these plates was made, resting one over the other on four small pieces of india rubber at the four copper corners. The air space between the opposed zinc and copper surfaces might be of any thickness, from half a millimetre to three or four millimetres. Care must be taken that there were no minute shreds of fibre or dust bridging the air space. In that respect so small an air space as half a millimetre gave trouble; but with three or four millimetres no trouble was found. The lowest and uppermost plates were connected by fine wires to the two pairs of quadrants of his quadrant electrometer, and it was generally convenient to allow the lowest to lie uninsulated on an ordinary table, and to connect it metallically with the outer case of the electrometer. To make an experiment (1) connect the two fine wires metallically, and let the electrometer needle settle to its metallic zero. (2) Break the connection between the two fine wires, and let a weight of a few decigrammes or kilogrammes fall from a height of a few millimetres above the upper plate, and rest on this plate. A startlingly great deflection of the electrometer needle was produced. The insulation of the india rubber supports and of the quadrants in the electrometer ought to be so good as to allow the needle to come to rest, and the steady deflection to be observed, before there was any considerable loss. If, for example, the plates were placed with their zinc faces up, the application of the weight caused positive electricity to come from the lower face of the uppermost plate, and to deposit itself over the upper surface of plate and weight, and on the electrode and pair of quadrants connected with it.

The Primary Action of the Galvanic Current.

Drs. J. Mount Bleyer and M. Milton Welll, of New York city, have experimentally investigated the influence of the galvanic current in promoting the formation of ozone in the blood, and they express their belief in the fundamental importance of animal electricity in respect to the chemical actions of living organisms. In a communication which has been submitted to us, after giving an interesting *résumé* of our knowledge of the nature of ozone and its occurrence in the blood, and discussing generally the physiological and chemical factors bearing upon their investigation, they relate the steps taken by themselves and the results attained by their inquiry. In order that the tests for ozone might be applied "in the open"—that is, in the free air of the laboratory, rather than in Schmitt's balloon—the inquiry was not undertaken until it was satisfactorily proved that ozone and nitrous acid, the presence of which would have invalidated their conclusions, were absent or only present in a negligable quantity. The blood selected for examination was taken from the carotid arteries of healthy rabbits. The blood serum, as well as the fibrinous clot, gave well-marked ozone reaction, and the latter, owing to the entangled red corpuscles, more distinctly than the former. A galvanic current of 10 volts and 15 milliamperes sent through the fibrinated blood notably increased the amount of ozone. Although a quantitative test could not be well applied, Dr. Dittrich and the investigators approximately determined that the amount of ozone after electrization was increased about two and a half times. So much for their results obtained from extravasated blood. A current of a strength of 40 milliamperes was then passed through the body of a healthy rabbit for five minutes, and blood from the carotid arteries tested for ozone. The investigators and Dr. Dettrich satisfied themselves that the reactions indicated a considerable increase in the quantity of ozone over that obtained from normal blood. From this result it is concluded that the polarizing action of animal electricity has an important influence *in corpore* in promoting the evolution of ozone. The writers conclude their interesting paper by some general remarks upon animal electricity, which they are disposed to regard as "the prime factor in all the processes of change of chemical action or otherwise within the living body." Careful as were the methods adopted by the investigators, and interesting as are the conclusions which they consider themselves justified in drawing, there are too much enthusiasm and too much generalization in their work to convince us that their position will prove scientifically unassailable. Nevertheless, we regard their contribution as a valuable addition to our knowledge of a most important subject.—*The Lancet.*

Wall Street and the Electrical Stock Market.

Stocks have been unusually dull during the week, the little activity manifested being due to the operation of professional pools. Money on call has been very easy, and there has been little change in the situation for time money and mercantile paper. Reports of compromise on the repeal bill as given in this morning's papers formed almost the sole topic of conversation on the Exchange. This was taken as a favorable development. A striking landmark in this year's financial movement is the fact that the bank deposits, for the first time since the early days of the panic, exceed the outstanding loans. So far as reported the government has bought this week 380,000 ounces of silver at prices between 73.6 and 74 5 cents per ounce, and the supply deposited against stock exchange certificates remains unchanged. At to-day's price for silver the bullion value of a silver dollar is 57¼ cents. Under free coinage a pension of $12 a month would be worth $6.89.

Among the bond advances for the week were Edison Electric Illuminating 5s 1½ points and General Electric 5s ½ point. General Electric closed to-day at 44¼, having reached 44¾ during the week, and selling down to 40¾, with a net gain for the week of 3 points. Western Union ended the week at 81¾, with a record of 82⅛ as the highest, 80⅜ as the lowest, and a loss of ⅞ point. The advance in General Electric was on buying by traders and some covering of shorts. The fact that nothing was said about a dividend at yesterday's meeting of the board of directors was ignored, as the belief has been general that the failure to declare a dividend at the last meeting of the directors meant that dividends were practically suspended.

Reports from the Boston stock market to-day showed the regulation Saturday dullness intensified. For West End Street Railway preferred, 77 was bid, Bell Telephone, 187 bid, Erie Telephone, 41, and Westinghouse Electric, 21.

The Edison Electric Illuminating Company, of New York, has declared a regular quarterly dividend of 1½ per cent., payable November 1. Books close October 15.

General Manager Royce, of the Thomson Electric Welding and Projectile Company, is reported as saying that the reorganization of the company was effected at Portland, Me., September 23, a large majority of the stockholders of both the Thomson Electric Welding Company and the American Projectile Company assenting.

New York, October 7, 1893.

PERSONAL.

Oliver Ames, 2d, of Boston, has been elected a director of the General Electric Company to fill the vacancy caused by the death of his father, Frederick L. Ames.

Mr J. J. Carty, engineer for the Metropolitan Telephone and Telegraph Company, left New York for the World's Fair on the New York Central "Flyer," Thursday, of last week.

Prof. Hermann Von Helmholtz sailed for Bremen on the North German Lloyd steamer "Saale" last Saturday, after a final visit of a week in New York city as the guest of Dr. Herman Knapp.

Mr. John W. Van Etten, secretary of the Lyons, N. Y., Electric Light and Power Company, was badly beaten last Sunday by a man to whom he refused to lend his cane to strike another man with.

Mr. P. C. Ackerman, manager of the New York office of the American Electrical Works, has just returned from a very successful trip through the West. Mr. Ackerman reports that the business situation is improving.

Mr. E. J. Hall, vice-president and general manager of the American Telephone and Telegraph Company, returned a few days ago from his Summer visit in Europe. Mr. Hall was accompanied by his family, and returned much benefited by his rest.

Prof. George Forbes, the well-known consulting electrical engineer, of 34 Great George street, London, has opened offices in the Mills building, Wall and Broad streets, New York. Mr. Horatio A. Foster, who has a large acquaintance in the electrical field, will be in charge of these offices as Professor Forbes' chief assistant.

The New Incandescent Arc Lamp.

In a recent issue of the London *Electrical Review* a communication from Sir David Salomons was printed in which he stated, in substance, that the idea for a new incandescent arc lamp put forth in Mr. Louis Marks' paper before the World's Congress of Electricians, was not novel and that the lamp described was practically a Jablochkoff candle. In the London *Electrical Review* for September 22, 1893, the following letter from Mr. Rankin Kennedy was published:

"Sir David Salomons' letter interested me very much, as I had recently made some experiments with a Jablochkoff candle enclosed in a narrow glass bulb. I cannot, however, agree with him in claiming that a Jablochkoff candle in a closed tube or globe is quite the same thing as described in Mr. Marks' paper. It makes a vast difference if you substitute an arc between the ends of two ordinary sized carbon rods for the arc between the parallel rods of small diameter in a Jablochkoff candle.

"In my experiments with the candle I have obtained some very curious results, not yet interpreted; these shall be published some time in the near future. In Mr. Marks' paper the carbons are said to be very pure, the glass envelope as small as it possibly can be used, so that it attains a high temperature; this high temperature prevents deposition of carbon on the inside. The arc is regulated by an ordinary arc regulator, and is, therefore, quite different from a candle.

"There can be no increase of pressure in the gases in the bulb, seeing that the carbon must work easily through the cap on the bulb, and the working of the carbon through the cap is not a difficulty, as is supposed by Sir David Salomons."

OBITUARY.

The death is announced of Mr. Henry Weaver, the managing director of the Anglo-American Telegraph Company, who died suddenly at Folkestone, England, from heart disease, at the age of 68. He was born at Shrewsbury, in May, 1825, and entered the service of the Electrical Telegraph Company at the age of 21. After the transfer of the inland telegraphs to the State he took the management of the Anglo-American Telegraph and the Atlantic Telegraph Companies, which position he had held since the beginning of January, 1870.

The Cologne, Germany, municipal station is now supplying current for power purposes at six cents per 1,000 watt hours

Trapping the Train-Robbers.

(From *Harper's Weekly*. Copyright, 1893, by Harper & Brothers.)

It was about 11.30 P. M., and only three men were left in the comfortable rooms of the New York Electric Club. They were gathered in front of a cheerful grate fire, each lolling in the attitude that best accorded with his particular idea of comfort, without regard to appearances. The click, click of the billiard balls had ceased, and the noisy laugh of the group of story-tellers no longer echoed through the lofty rooms. The three fire worshipers were left alone to "talk shop." They had drifted from a discussion on the newer forms of incandescent lamps, by way of an argument, on a complicated question of long-distance electric power transmission, to the subject of electric heating. There had been several other interesting points brought up in their talk, but just at the moment it was on electric heating, which McGraith, who had his feet on the mantelpiece and was pulling lazily at a portly pipe, held would in five years displace coal, gas, oil or any other fuel for cooking and heating purposes from every decently appointed household.

"You ought to have Billy Black here," said one of the others; "he's a regular crank on electric heating. He cooks his lunch in his office now, on a stove connected to the lighting mains, because, he says, anything not cooked by electricity makes him sick. Swears he can taste the product of combustion in anything but a boiled egg, unless the cooking is done by the current."

"By-the-way, where is Billy?" asked McGraith, when the laugh had subsided; "haven't seen him for a long time."

"Last I heard of him he was out West, hunting."

"Hunting? I never knew he was a sporting man."

"He's not. He's hunting two-legged, wingless game on approved scientific principles."

"What the dickens do you mean?"

"Well, you know Billy's always working at some fantastic scheme or other. The last thing he hit on was a trap for train-robbers. Worked the whole thing out completely, but couldn't get any railroad president to believe in it. They all thought he was a crank, and, as it meant some little outlay to try it, not one of them would give him a chance. Railroad men don't believe much in electricity, anyhow, they have so little experience with it, except in connection with rusty telegraph wires and broken-down relays that don't work half the time.

"Finally, it seems, Billy struck the right man out in Denver, the vice-president of the A. B. and J., that runs out by the jug-handle route to the Pacific coast. The president of the road was away in Europe, and Mr. Vice, being acting president, determined to give Billy's scheme a trial. He was half off his head when he wrote to tell me about it, and was working 17 hours a day to get things ready. But I've seen by the papers that it worked all right. Billy bagged a gang of train-robbers just as neatly as the New York police gather in the members of the swell mob that they've known intimately for years."

"How did he manage it?"

"That's just what I'm waiting to hear from him. He's due here to-night, and promised to look in at the club if he got in early enough. The papers gave no particulars. I suppose the railroad people managed to keep the *modus operandi* quiet, so as not to give the snap away to other gentlemen in the same line of business as Billy's victims."

A heavy tread sounded on the steps outside, and a moment later the hall door flew open in response to the pressure of the new arrival's foot on the electric door-opener in the corner of the doorstep. A bell tinkled inside as the door opened, and a sleepy servant came forward to take Mr. William F. Black's hat and overcoat. As he came into the room he was enthusiastically greeted by the three.

"Here, Billy," said McGraith, when the clamor subsided, "we're dying to have you spin your yarn. Gurney has just been telling us that you've turned into a sort of electro dynamic Byrnes. You'll have to read a paper about it before the club—tell you that, old chap. But just consider us the editing committee, and give us the plain unvarnished tale, without any frills and formulæ." McGraith was a practical man, and had a supreme contempt for theory and mathematical demonstrations.

"Well, boys," began Black, when he had settled himself in a big chair, with his feet on a smaller one, had provided himself with his favorite drink, and had puffed half an inch of ash on the end of a six-inch cigar, "it was ripping!"

"Talk about your shows of new inventions for the newspaper reporters, with everything fixed up in lecture-room style, and lots of spare gear to fake results with if anything goes wrong—why, they aren't in it. Fancy having to make a practical demonstration of a new invention on a train out in the middle of the prairie, with a scratch plant rigged up on the spur of the moment, and no skilled help; no time to get her running properly beforehand; and then, if the thing didn't work, the prospect of getting short circuited by a high-pressure discharge from a six shooter! It takes a good deal of faith in one's own work to carry a thing through on those lines; but I was kind of cornered, and I had to scrape up the faith or lose the chance.

"You see, Fredericks, the acting president of the A. B. and J., was the first man who showed any real interest in the scheme. He let me explain the whole thing, and asked a lot of questions, and they weren't so very much off the mark, most of 'em. Seemed to know something about electrics, and he evidently fancied the idea.

"'Well, Mr. Black, it looks as if it would work all right. And you say you are quite confident of it?' he said at last, when I had settled all the points he had raised.

"'Dead sure,' said I. 'It looks rather complicated, but it can't fail unless the train parts.'

"'We can guard against that, barring accidents, which don't often happen on our road.' (They had pitched three sleepers and a baggage car down a fifty-foot embankment ten days before, but I thought I wouldn't refer to that, as he seemed to have forgotten it.) 'Now, how soon could you fix this apparatus up?'

"'Oh, in a couple of days, easily,' I said. 'I can get a machine right here.'

"He looked over a memorandum lying on his desk for a moment or two; then he said: 'That will just do. We will give you a trial, Mr. Black. We have a train going out at midnight on Thursday. This is Tuesday, so you have over forty-eight hours to fit up your plant. You shall have all the help you need, and you can buy the materials in our name. I feel sufficient confidence in your scheme to give you a fair trial in actual practice.'

"This rather took the wind out of my sails for a moment. I had hoped when he had let me explain the thing properly to get authority for experiments, with decent time to prepare things in. But to be let in for a practical demonstration out on the road, with only forty-eight hours to fix things up, was a little more than I had bargained for. Even a sanguine inventor can get too hearty encouragement sometimes, I find, though it is the only case I have met with so far. However, I had committed myself, and pride would not let me go back. Besides, I was afraid if I showed any signs of backing down, or asking for an experimental trial, that I should spoil my chance, and, perhaps, never get another. So I thanked him warmly, expressed myself delighted with his enterprise and liberality, and in a few minutes he had arranged things so that I should get all the help I needed from his people, and I was hustling down the street to get the plant together.

"It was pretty tall hustling for those two days. Never had such a spell of work in my life before, and don't want it again. The time when we had the fire in the telephone exchange at Detroit, and had to rig up a new switchboard and get 13 hundred subscribers working again in five days, was a joke to it. That was what sickened me with the telephone business—that and getting an average of three complaints a day from each subscriber. I've got a scheme on hand now for a telephone protector—not a lightning protector, but a dodge to protect the superintendent from the subscribers' complaints. There's a fortune in it if I can get a good patent."

"Of course there is, Billy," broke in McGraith; "but go on with the train story."

"Well, those two days I spent on an everlasting rush between the freight yard and the supply houses. Fortunately I had made out very clear plans, not mere diagrams, but practically working drawings of the whole scheme. There was a man in the railway company that they called an electrician, probably because he had failed to make a living at putting up electric bells, and had got a job through influence when his stock was sold up by the sheriff. However, he helped me a good deal, as he knew how to run wires and make joints; though he very nearly ruined the whole thing by making a wrong connection, and if I had started up without overhauling his work, my dynamo would have been short-circuited and the whole job spoiled.

"I was provided with an empty baggage car for my plant, and had full sway to make whatever modifications I thought proper or necessary in the express car. The baggage car very soon looked like a traveling central station. I fixed up a small alternating current dynamo coupled direct to a high-speed engine, getting steam from the locomotive. Then I had a train-telegraphing outfit, so that we could get direct communication with the company's wires. Besides that there were two special circuits to the locomotive for operating certain devices, and other circuits to the other cars. The floor of the express car I had covered with iron plate, and to that I ran one side of the dynamo circuit; then I connected every other bit of metal in the car to the other wire, placing strips of copper and hoop iron wherever there was any spare space, and connecting them all together. I arranged a sort of curtain of wire netting over the door, on the inside, rolled up neatly, and held so that it could be let down by pressing a button. The switchboard I fixed up for controlling all the circuits would have done credit to a city central station. I think that was all. Oh, no, wait a moment! In the baggage car I had a telephone, a long distance transmitter, connected with a loud-speaking receiver fixed to the roof of the express car."

"Great Scott! What was it all for?" asked McGraith, voicing the half-bewildered, half amused looks of the other two.

Mr. Black pulled out of his pocket a very soiled and much folded sheet, covered with drawings of machines and circuits, and proceeded to give a detailed technical explanation of his system. It is scarcely worth while to repeat it here, both because the language might often be obscure to the unprofessional reader, and because the continuation of the inventor's narrative amply explains the working of the apparatus; besides the publication of a full description of the device might interfere with Mr. Black in his prosecution of a patent.

"Well, by the time we were ready to start, everything was in place, and I satisfied myself as far as I could that it was all in working order. There was some valuable freight in the express car, and of course our friends, the enemy, had advance information, or, at any rate, we supposed they had, and I felt pretty confident of a meeting. At the last minute I got all the men together, and with the vice-president as chairman, delivered a little lecture, giving them full instruction in the parts they had to play. They almost all entered into the spirit of the thing, as they naturally welcomed a chance of getting even with men who had often bested them. There were one or two kickers, of course, who declared that 'such a lot of truck' would never work at the right time. But they weren't willing to try for themselves when I offered to start up the machine if they would get inside the express car. I invited Fredericks to go with me and help work the switches, but he said he was much too busy, and besides he was expecting the president back very soon.

"We went along all right the first day, and nothing happened. At night I started up the dynamo in readiness. It was lonesome, ticklish sort of work, all alone in my little secret compartment, made by putting a false end to the car, and I felt a good deal more nervous than I did that time at Pittsburg when I tried the flying machine with aluminum accumulators. I was almost beginning to get afraid that nothing would happen after all, when I felt the train slackening. It was the usual dodge. We were going up a steep grade, and they showed a red light and boarded the locomotive while we were going fairly slow.

"The engineer pretended mortal fright, and gained sufficient time to get us to the top of the grade all right. When we were fairly stopped, the beggars got to work in their regular manner, and made a determined attack on the express car. Through the loud-speaking telephone and the head receiver I had on, I could tell exactly what was going on. When I judged they were all properly engaged, I drew a long breath and let go.

"Giving an unearthly scream into the transmitter, that must have resounded through the express car like a voice from the infernal regions, I clapped down first one switch and then another. The first switch exploded the fuses on the engine and in the other cars, the second opened the throttle-valve of the locomotive as sharp as the click of a sounder. The confusion that followed was like an earthquake and an infantry battle all in one. There were blinding flashes all along the train, and a thundering jerk as we started off. Then followed blood-curdling oaths and yells and a crackety-crack of revolver shots like one of Tesla's two-million-alternations-a-second discharges. I scarcely waited for the express messenger's signal, though I was kind of conscious that I got it all right, and I made a wild jab at the other two switches that turned on the dynamo current in the express car, and let down the wire netting over the door. Then I sat back to breathe for a moment, and to wonder if anybody had got killed.

"The disturbance in that very novel kind of an electric car was something *not* to dream of. The beggars were trapped, but it was a little while before they could believe it, and a den of devils incarnate couldn't have kicked up a bigger racket. Just at first they tried shooting around indiscriminately, but they saw that the train was gaining speed and that they were wasting time. They nearly did the trick, though, as one of the bullets went through both cars and cut the insulation off one of my main wires; quarter of an inch to one side and it would have carried away the wire and cut off the current. But it didn't, and when one of them made a dash for the wire netting he was chucked back like a feather by the 500 volt shock he got as soon as he barely touched it. Evidently they couldn't make it out, but one or two more trials must have convinced them that it was no go.

"By means of the telephone in the roof of the car I could get a pretty general idea of what was going on, and I gathered after the first few minutes that my neighbors were just about as scared a lot of villains as could be met with from Maine to California. I always had the fear, however, that they might discover that by remaining on the iron flooring, without touching any other part of the car, they could not be shocked. I had narrowed their fighting area as much as possible by suspending some iron wires connected to the other side of the circuit from the roof, and these I let drop, just after we started, by burning out with the current the little fusible wires that held the free ends. In this way there were hanging from the roof to within about two or three feet of the floor several bare iron wires that they could not touch without getting shocked. The wires, of course, swayed about with the motion of the train, and after their smart repulse by the netting over the doorway the beggars must have had a rare dance dodging them. Lord! I would have given a hundred dollars to have been able to take a peep into that car and watch the bear dance that was going on there.

"By-and-by they began to get the bearings of the situation, and things got quieter. I was just preparing to give our new passengers a little lecture over the telephone when I heard a scream of pain, followed by a clatter of metal falling on metal, and a loud report. Then things were quieter than before. I guessed what had happened. The revolvers had been dropped, after the first flurry, in the struggle with the charged screen over the door. One of the artful dodgers must have groped for his, and either found it in contact with some point of the other side of the circuit, or touched it to one of the swinging wires as he raised it. Result, he got a terrific shock, and the pistol flew out of his hand, exploding as it fell on the floor. I judged that this little incident would give point to my remarks, and I bellowed into the telephone:

"'Friends, you are nabbed, and you may as well make the best of it. The science of the effete East has been one to many for you this time. No more attempts at shooting, please, or I shall have to turn on some more of the juice.'

"These plain words seemed to have a bad effect. They were answered by a volley of oaths of a very choice quality. I thought there was just a chance that they might yet get on to my curves and do some mischief with the revolvers. So I played my last card. I yelled into the telephone with all my might:

"'Stop your row, you blithering idiots. Keep still and keep your hands quiet. If you don't, by thunder, I'll electrocute the whole blamed lot of you, just like we do the murderers down East. See!'

"With that—in the heat of the moment it was perhaps a little more forcible than I have expressed it—I gave them a display of fireworks to illustrate my resources. Touched off a few spark devices—something after the Tesla style of business, but a modification of my own—that I had placed in the corners of the car. At the same time the train rounded a sharp curve, which set the hanging wires a-swinging, and another panic started in the car. Pandemonium reigned again for a minute, but this time the beggars were regularly terrified clean through. They howled and screamed for mercy.

"I judged that the fight was pretty well knocked out of them, and I gave a sepulchral roar through the telephone:

"'Lie still and you will be spared for the gallows!'"

The big room rang with screams of laughter, and Mr. Black seized the opportunity to take a long pull at his drink. Then, drink and laugh ending together, he went on:

"I was the *deus ex machina*, and I may as well tell here, as if, *deus*like, I could see everything; what was going on in the other parts of the train. I heard it all afterwards, but that doesn't matter. It all came out right. The engineer and the fireman followed

out their instructions to the letter. They kept as far back from the levers as possible to disarm suspicion, and maintained a keen watch on the men who were covering them, so as to get their exact bearings. When the flash of my fuse and the jerk of the engine came, the two robbers were, of course, rattled for a moment, but the engineer and the fireman ducked and grappled each with his man like two wild cats. There was a desperate struggle. The fireman got grazed in the leg by a flying bullet, and the glass of the pressure-gauge was broken by another. That was all the harm that was done, though, except to the robbers, for the crew of the locomotive were powerful men, and as soon as she got up speed they had a decided advantage, being thoroughly at home on what the sailors call a 'moving platform,' which the others, of course, were not. All the same, they had a tough job, and it was quite a little while before the engineer had put his man to sleep and could attend to his machine, which, by this time, was going for all she was worth.

"Much the same thing happened in the other car—the train was a special, with only one passenger car. The flash and the thick smoke gave the trainmen their chance, and they were on top of their man in a jiffy. He fired blindly; but a man with a revolver when he's rattled nearly always fires high, and the bullet went through the roof of the car, smashing a lamp chimney *en route*. The broken glass gave a passenger who was holding his hands up a bit of a scratch on the thumb. That was the only casualty, and an inch of sticking plaster was all the remedy required. But the injured man was a Connecticut lawyer, and an experienced traveler, and he has begun a suit for damages against the company. Asks for ten thousand dollars damages for injury and shock to the system. Strikes me if all the passengers who got shocks to the system that night got ten thousand dollars apiece the A., B. and J. would be in the hands of a receiver.

"The express messenger made a clean jump from the middle of the car when he got my flash signal, and the screen caught him in the back as it came down. He sprawled in the dust, but managed to gather himself up again in time to swing on to the platform of the passenger car. Then he went to the assistance of the trainmen, and lucky he did so, as their man was a clinker, over six feet, and muscles like Sandow. I had taken the precaution to provide the messenger with rubber gloves and boots in case of accident, and as he clapped his hands over the robber's face and bore him back the man must have thought a wild beast had re-enforced the other side. Whatever he thought didn't matter; they had him bested, and in a few minutes he was shut down and out of circuit like the two on the engine.

"By the time that I had my car load of thieves under control, I could tell by the speed of the train that the engineer had got his department free from outside interference, and was looking after his locomotive all right. That was a pretty considerable relief, because the speed at first was something frightful, and if the engineer and fireman had got the worst of it, we should all probably have gone to kingdom come, unless the steam had given out before we struck anything, which would have been almost as bad.

As soon as I could turn my attention from my charges, I switched my head telephone over to the train telegraphing outfit. They were waiting for me on the wire at the stations along the line, but I couldn't get them, because the induction from the alternating dynamo drowned out the signals. I pottered with the thing for some time, but it was no go. So I played a bold stroke. I opened the dynamo circuit, cutting off the current from the express car, and keyed off with all my might: '*Got gang O. K. Can't say more. Dynamo opened to send this. Black.*' I waited a few seconds and got '*O. K.*' Then I clapped down the dynamo switch again, and thanked the gods that they had a man on that wire who could think. If my captives had only known it, for about half a minute they were discharged. But even if they had known it, they could scarcely have done much. I breathed more freely when the current was on again, all the same.

"The rest of the run to the station, where our reception awaited us, was uneventful. There were occasional slight disturbances in the electric car as we rounded the curves, and now and again I gave the poor chaps a few experiments with the sparking apparatus, just to keep their spirits up.

"When we pulled in there was a gathering that looked like an Anarchistic mob. The sheriff's posse was armed with every conceivable weapon, from six-shooters to sledge-hammers. The shout that went up must have had a cheerful sound to the gentlemen of the road. The screen was cut down, and they were ordered to tumble out. There was not much hesitation, even though it might have looked like jumping from the frying pan into the fire. But they were evidently anxious to get out of that car. A more pitifully scared-looking lot of wretches you never saw or imagined. They were trembling all over, and when they got on solid ground most of them could scarcely stand upright, but sank in heaps on the platform. They were really more frightened than hurt, but still I didn't envy them their ride."

"Billy, you'll be the death of us," said Mr. McGraith. "But do you really mean to say that the company has adopted the scheme?"

"Well, no. That's the part that riles me, after making a practical demonstration with unqualified success. I bagged a gang of nine ruffians that have troubled the roads and defied capture for years. The train crew were not very enthusiastic about the scheme; seemed to think that their part of the job was not in a regular day's work, and more risky than they liked. When I got back to Denver I found a letter from the president, who had returned, congratulating me on my success, and thanking me for having effected the capture of the gang. He stumped up pretty liberally for the job, I confess, but went on to say that, as there appeared to him to be several elements of uncertainty about the scheme which might on other occasions militate against its complete success, he did not feel justified in putting it into regular practice, nor in treating with me for the acquisition of the patents.

"Those were his exact words, and they so disgusted me with the ingratitude and lack of appreciation that these self-sufficient officers of great corporations show that I came back East right away. Now, boys, if you will join me, we will go to my diggings and christen my new electric range. It has all the latest improvements, and when you've had supper from it you will confess that Delmonico's dishes taste as if they'd been cooked in a ten cent east side restaurant."

Mr. Black had got back to his favorite hobby, and the others followed him out of the club to watch him ride it and to enjoy his hospitality.

HERBERT LAWS WEBB.

The Cup Defender, "Vigilant."

The Ansonia Brass and Copper Company, New York, have issued a very timely pamphlet containing much information of interest about the cup defender, "Vigilant," and her British competitor, "Valkyrie." Particulars of the races are also given and every reader of the ELECTRICAL REVIEW who is interested in yachting should write for a copy of this pamphlet which carries on its front cover an excellent picture of the "Vigilant."

We select the following information from this book:

A syndicate, composed of Commodore E. D. Morgan, C. Oliver Iselin and others, directed that the present Cup Defender, "Vigilant," be constructed by the Herreshoff Manufacturing Company, of Bristol, R. I., and that the center board, rudder, hull plates and rivets below the water-line be made of rolled Tobin Bronze. The frames and hull plates above the water-line are steel.

The following are the principal dimensions of the "Vigilant:"

Length over all	128 feet.
Beam	26 "
Length on load water-line	86.12 "
Draught	14 "
Displacement (approximate)	140 tons.

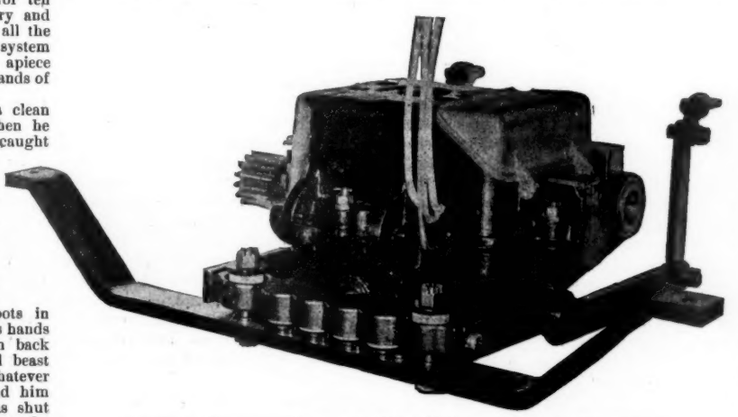
This is the first time in the history of yacht building that Tobin Bronze has been used, instead of steel, for the construction of the hulls of yachts. Its relative merits as compared with steel to resist the corrosive action of sea water and prevent the adhesion of barnacles and animalculæ, thus causing a smoother surface, has so far been favorable to the bronze.

Tobin Bronze, of which The Ansonia Brass and Copper Company, New York, are the sole manufacturers, has the tensile and torsional strength of mild steel, and can be readily forged at a red heat. It has been largely used by yacht builders for center boards, fin keels, rudders, propeller shafts, bolts and forgings. It is also used by all the leading pump makers for piston rods.

A New Method of Motor Suspension.

Among the improvements which the introduction by the General Electric Company of the new G. E. 800 street car motor has brought into street railway practice is a new method of suspending the motor on the axle and the truck, whereby it is made to rest upon a resilient system, the weight being supported at a point immediately below the center of gravity of the motor itself. This system of suspension is known as the cradle suspension, and its advantages can be seen by reference to the accompanying illustration.

Immediately below the armature bearings are trunnions on each side of the motor, set in side bars, which are pivoted at the front to a special casting, and supported at the rear end from link bars bolted to the truck frame. The front special casting is mounted upon six springs, two of which offer resistance to pressure upwards, and four resistance to the downward pressure.



GENERAL ELECTRIC COMPANY'S NEW METHOD OF MOTOR SUSPENSION.

It will thus be seen that this modification in the system of motor suspension is of significance in electric railway practice. The motor being set upon a spring-like cushion, the greater part of the dead weight is taken from off the axle itself and is more evenly distributed to the axle bearings, and that part of the truck which can better stand the strain. This, in conjunction with the extraordinary lightness of the motor, means great economy in track maintenance and a decrease in the possibility of accident to the axles. A series of careful tests have already proved the value of the improvement which promises to become general where the G. E. 800 is used.

The method in question does not constitute to-day a part of the outfit sent regularly with an equipment, as the opinions of engineers still differ as to preferring this method to the method which has been usual in the past. It is probable that the truckmakers of the country will take this matter up, so that those desiring to use this method can order the necessary cradle frame fitted specially to the trucks which they may purchase when the motors have been purchased from the General Electric Company, thus making clear the right of the customer to use this patented method of suspension. This method will be seen at the Milwaukee Convention, when the street railway engineers will have a good opportunity to examine it.

Fire last week destroyed the immense car barns of the Canton-Massillon, O., Electric Railway Company. The loss will exceed $100,000; insurance about half.

World's Fair Awards.

FURTHER ANNOUNCEMENT OF HONORS IN THE ELECTRICAL DEPARTMENT.

The judges in the Department of Electricity at the World's Fair made the following announcements of further awards on October 2. There are still more awards to be made, and these will be published as announced:

UNITED STATES.

American Battery Co.—Storage batteries.
Electrical Engineer.—Historical electric railway model (Davenport's).
Elisha Gray.—Telautograph.
General Electric Co.—Incandescent lamps used for decorating rooms and other structures.
A. H. Phelps.—Electro pyrogravure process.
Westinghouse Electric and Manufacturing Co.—High tension experimental apparatus.

AUSTRIA.

Schindler & Jenny.—Electrical cooking apparatus.

GERMANY.

Gasmotern Fabrick "Deutz."—Dynamo directly connected to gas engine.
Hartmann & Braun.—Galvanometers of special form.
Chas. Pollak.—Storage batteries.
Reiniger, Gebhardt & Schall.—Electro-medical apparatus.

GREAT BRITAIN.

Epstein Accumulator Co.—Storage batteries.

TELEPHONE CHAT.

The Wisconsin Automatic Telephone Company is preparing to extend its lines to Janesville, Wis., and open an exchange at that place.

Davis & Soule, of Augusta, Me., will soon commence the endeavor to raise a working capital for the Bradford Self-Closing Telegraph Key Company. The new company will build and equip a plant for the manufacture of the keys at Clinton.

At a meeting of the village trustees of Waukesha, Wis., the petition of the Automatic Telephone Company for a franchise was indefinitely postponed by a vote of three to two. General Manager Cottrill, of the Wisconsin Telephone Company, opposed the petition.

The New England Printing Telegraph Company closed its Woonsocket office last week. The company has done a general telegraph business in that city for about three years, and has for a year or two worked in harmony with the Postal Telegraph Company, accepting business for points on the postal lines.

Within two days after January 30, 1894, the Shaver telephone, which was recently constructed and for a time operated in McKeesport, Pa., will be put into regular operation by the local company, and the return of this new "hello" system will be warmly welcomed by McKeesporters. The above information was furnished by a member of the company last week. He states: "The discontinuing of the service here several months ago was the result of the suit of the Bell Company against the Shaver Company to enjoin the latter from using the permanent magnet, which, it was asserted, was an infringement on the plaintiff's patent. This patent, however, expires on January 30, 1894, and immediately afterward the local company will be in shape to resume operations without interference, and will so improve and extend its service as to meet the favor of everybody. When the company was compelled to cease operations it had 90 subscribers, and many more will be added upon the permanent resumption next year."

Death of Howard L. Requa.

Mr. Howard L. Requa, son of Mr. Leonard Requa, general manager of the Safety Insulated Wire Company, of New York, died suddenly of heart failure, October 1. Mr. Requa, though a young man, was the chief electrician of his father's company, and was a most promising and talented gentleman, highly esteemed by all who knew him

Lecture Upon Metallic Interstitial Electrolysis.

DELIVERED IN THE COURSE OF CLINICAL INSTRUCTION IN GYNÆCOLOGICAL ELECTROTHERAPEUTICS AT THE WEST SIDE GERMAN CLINIC, NEW YORK, BY AUGUSTIN H. GOELET, M. D.

In 1891, my friend and colleague, Dr. Gautier, of Paris, suggested a novel method of electro-chemical medication, which he designated interstitial electrolysis. It consisted in the application of a solution of iodide of potassium, which was decomposed by the action of the current and either iodine or potassium was liberated according to the pole upon which it was employed. The purpose of this was to increase the antiseptic and germicidal power of the current at the poles. It is well understood that this effect is obtained only at the positive pole with the ordinary method of using the current, and that only when a strength of current is used which is rarely tolerated easily.

Gautier instituted experiments which demonstrated the positive germicidal power of both poles when a solution of iodine of potassium is employed with a current strength of only 25 m. He further demonstrated the fact that this action is not limited merely to the surface in contact with the electrode, but that it penetrates to some distance beneath the surface. That, in other words, the action is interstitial.

He applied this method to the treatment of keloids, lupus, ulcerations, cysts, hydrocele, vericocele, chancres, buboes, etc., and to urethritis and endometritis as well with marked success. In the female urethra he used the positive pole with 25 m. and in the uterine canal the negative pole with 50 m. In both instances he employed an applicator made of platinum, which was wrapped with absorbent cotton and dipped into a solution of iodide of potassium, having a strength of one to 10 parts of water.

About the same time, or possibly before, Prochownick published the details of another method of enhancing the germicidal properties of the positive pole. He employed as an electrode a copper sound with that pole. He applied it first to the cervical canal in a case of gonorrheal infection, using a current strength of 80 to 100 m. for 10 minutes, and noticed that the gonococci disappeared and the discharge became serous after three applications.

To Gautier, however, is due the credit of developing and popularizing this method of application, which he designates a form of interstitial electrolysis.

A more comprehensive term is metallic electrolysis; since the action depends upon the electro-chemical decomposition of the metal employed as an electrode. You will understand, of course, that this action can take place only at the positive pole, since it is here that the oxygen, chlorine and acids which act upon the metal, congregate, so to speak.

Instead of a chemical decomposition of the tissues in contact with the electrode, which occurs when a non-attackable metal, such as platinum or gold or carbon is employed, the metal is acted upon and the formation of an oxy-chloride of copper is the result. That is, the decomposition liberates upon the surface of the electrode, and consequently upon the tissues in contact with it, this salt of copper, which has an apple green color and is insoluble. As soon as formed this salt is driven into the tissues beneath the surface, by an electrical osmosis or cataphoresis, as one of the direct effects of the current. This was very clearly demonstrated by Gautier, in his experiments upon the uteri of rabbits which had been submitted to the electrolysis of copper. The tissues for a considerable distance were stained an apple green color. He also demonstrated positively that these salts of copper exert no deleterious effect, but on the contrary, he found them to be therapeutically valuable.

One great advantage claimed for this method of application is that the usual caustic action upon the tissues, which occurs when non-attackable electrodes are employed, is avoided when attackable metals are employed, since the action takes place upon the metal instead of upon the tissues.

Gautier seems to have limited his observations to metallic copper, though any other oxidizable metal may be employed in the same manner, such for instance as zinc, silver, iron, lead, tin, etc. It will thus be perceived that this opens up an enormous field, and affords an opportunity for a greatly diversified application of electricity.

This suggested to me the use of zinc, where the action of the oxy-chloride of this metal would be likely to prove beneficial, and my observations, which have now been extensive, extending over a period of a year, have satisfactorily demonstrated the usefulness of this method of application. These I will enumerate further on.

Let us consider, first, what are the advantages of this method of employing the salts of the different metals, over the ordinary method by means of crystals, fused pencils, solutions, etc. It is very generally understood that when these agents are employed in the ordinary manner, the action is entirely superficial and consequently imperfect and unsatisfactory in the majority of cases. Also, it is not quite possible to localize the action satisfactorily, but it becomes diffused over a greater area of surface than is often desirable. The soluble nature of the agent provokes irritation, which is frequently prolonged for an undesirable period afterwards.

The method under consideration, which we will term metallic electrolysis, possesses numerous advantages, which should commend it highly. Likewise some of the disagreeable features consequent upon the other method of application are avoided. In the first place it is possible to confine the action within desirable limits, the formation of the salt resulting from the decomposition of the current being confined to the area in contact with the electrode or metal, and as soon as formed the salts, both those which are soluble and those which are insoluble are driven into the tissues beneath, as the result of an electric osmosis or cataphoresis. By regulating the strength of the current, and the duration of the application or contact of the electrode, the extent of the action can be very nicely and accurately varied.

This you have seen demonstrated repeatedly here in this clinic, when the electrode in some cases is allowed to remain in one position for five or ten minutes, and in other cases it has been kept moving over the surface.

The action upon the metal occurs very quickly, and this reminds me to warn you that when copper or iron is employed the electrode will become adherent, and it is sometimes quite difficult to remove it when the application is being made to cavities. Gautier suggested that the poles be reversed for a few minutes after the application is completed, in order to facilitate the withdrawal of the electrode, the action of the negative pole having the effect of loosening it. I have found this to be seldom necessary, however, if the electrode be carefully rotated upon its axis before any attempt is made to withdraw it.

Great improvements have been made in this method since its inauguration by Gautier, and its uses have been greatly extended. He recommended using a current strength of 30 to 80 m. and prolonging the application to 10 or 20 minutes. This has been found unnecessary and undesirable in many instances; so that now a strength of 20 to 30 m. is rarely exceeded, and the duration has been limited to five or 10 minutes, and even a shorter period is often more desirable. It is often better to keep the electrode in constant motion over the surface upon which it is desired to obtain the action. Much depends upon the surface to which it is applied and the condition with which you have to deal, as you have observed in the cases you have seen treated in this clinic.

To enumerate some of the uses to which this method of electro-chemical application with copper can be put: uterine hemorrhage, endometritis, urethritis and ulcerating surfaces may be mentioned as having been suggested by Gautier. My friend, Prof. W. J. Morton, has very clearly demonstrated its usefulness in certain conditions where it had not been thought of before. For instance, he has employed it quite satisfactorily in hæmorrhoids and ulcers of the rectum, using from 10 to 25 m. for five or ten minutes. In hemorrhoids, though applied to the surface, no irritation is provoked, and the tumor immediately shrivels up and gradually subsides. In some instances the tumor has been punctured with copper needles and the current employed through them, liberating the oxy-chloride of copper within, with very encouraging results. He has also employed it with great satisfaction in the treatment of both atrophic and hypertrophic rhinitis, using 10 to 15 m., and keeping the electrode moving to avoid sticking. He has attained the most signal success with it in the treatment of trachoma. In this condition a strength of only two m. is used, and the electrode is kept moving over the surface for only a minute at each sitting. Some of the most obstinate and unpromising cases have been cured in this manner after five applications.

I have employed cupric electrolysis extensively in the treatment of hemorrhage from the uterus and in endometritis, and have been very well satisfied with the results. In uncomplicated uterine hemorrhage it has no equal, and in endometritis, associated with a softened and relaxed condition of the uterine body, the results have been excellent. It is quite important, however, to be certain that the cervical canal is patulous for subsequent drainage, and this part of the canal should be excluded from the action when possible, to avoid uterine colic, which I have found to result from the treatment when these precautions are not observed.

I am in the habit of employing from 20 to 30 m., for five or ten minutes, for the control of uterine hemorrhage, and, as you have often observed here in the clinic, it will control the bleeding when every other means have failed. The result is both prompt and permanent.

In endometritis I employ from 10 to 15 or 20 m., for a period of five minutes only, and have found this quite sufficient in the majority of cases where it is indicated.

I have used cupric electrolysis also with great satisfaction in fissure of the anus, using from 10 to 15 m. for three to five minutes only. Healing has been accomplished in this manner after only two or at most three applications, without stretching the sphincter. In proctitis there is nothing equal to it. Here a strength of from 10 to 20 m. is used, and the electrode is kept in motion, so the whole surface may be submitted to the action. In ulcer of the rectum this method of treatment likewise yields excellent results. Here the surface may be exposed with a speculum and the action localized where desired.

I have also applied cupric electrolysis to the cavity of vulvo-vaginal cysts, after evacuation, and have thus promptly arrested the secretion and effected rapid healing. It may be utilized in the same manner in the treatment of other cysts also.

The electrodes are made in various shapes and sizes, from an ordinary rod of copper to a bulb the size of the thumb. For uterine applications a piece of pure copper wire of suitable size, with the end rounded and smoothed off, may be used; and this may be insulated by a coating of shellac or a piece of catheter. When a copper electrode has been once used it must be thoroughly cleansed and rubbed off with emery cloth, so as to have always a bright clean surface, before it is again employed.

For the past year I have been making use of zinc in the same manner as copper, and have found that when decomposed by the current it possesses certain qualities essentially different, which entitles it to rank as equally valuable. The electro-chemical decomposition of a zinc electrode by the positive pole results in the formation of an oxy-chloride of zinc, which cannot be attained in any other way. With a strong current it is capable of extensive destructive action. It was employed by Gröh, a good many years ago, for the destruction of cancerous growths, by means of needles inserted into the structure. I have not, however, employed it for this purpose. By moderating the strength of the current, and limiting the duration of the application, this destructive action is avoided. In fact, the result is then only a softening of the tissues, and sloughing does not occur. This action I have applied to the softening of fibroid and keloid growths in cases where the negative pole would be contra indicated, and also in conditions of sclerosis, with very gratifying results. Here it is employed by means of puncture with needles made of pure zinc, five to ten m. being used for five or ten minutes. Some of the results have been truly remarkable, but my observations are not completed, and for this reason I have published nothing upon the subject.

I consider that the greatest value of zinc electrolysis is in the treatment of endometritis, associated with a condition of sclerosis of the uterus, and in granulation or so-called ulceration of the cervix. You have had abundant opportunity of observing how promptly it acts in curing these conditions. I know of no other method of dealing with this condition of granular degeneration of the cervix which will give anything like the prompt result that this will.

You will recall the case which you saw treated at the last clinic, where a complete healing of the surface had been effected by six applications.

You are already familiar with my method of application of zinc electrolysis in the different conditions where I employ it, and I need not repeat here. But I will ask you to pay particular attention to the details, for very much depends upon its proper application. I would advise you to take close notes of the strength, duration and frequency of the application, etc., in the different conditions, as you see them treated, for your future guidance in your practice. In this manner only will it be possible for you to get the same results which you have witnessed here.

GENERAL NOTES.

Through the carelessness of a watchman at the Elmwood, O., railroad crossing, the Big Four fast passenger train from Cleveland, running 60 miles an hour, struck a crowded electric car and cut it in two. Motorman Lon Cass was instantly killed, two persons were seriously injured and four others badly hurt.

The Consolidated Traction Company has issued orders to the motormen and conductors on the electric road between Irvington and Newark, N. J., that they must hereafter wear white collars and neckties. The men have been seeking comfort in negligé shirts, and were inclined to grumble at the interference with their personal predelictions, but they will not quarrel with their bread and butter. One man said that hereafter he would wear full dress after 6 o'clock in the evening, but he would resign if the officers of the road ever asked him to wear it in the daytime.

In January last, while H. Ward Leonard & Company, contractors, were constructing the Cayadutta, N.Y., electric road, near the upper flouring mill of G. Fettle & Company, their employés negligently, it was alleged, caused a premature explosion of dynamite, resulting in the death of Andrew Hayner, a teamster, of Amsterdam, and in the loss of an eye to Deloc Getman, of this village. Getman and the widow of Hayner, through their counsel, J. S. Setterly, brought action against Leonard & Company for large damages, resulting from their alleged negligence. The cases having been called on for trial at the last term of the Supreme Court, a settlement was effected by the company paying to Getman and Mrs. Hayner $6,000.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

New Electric Railways.

CHARLESTON, W. VA.—The Graham Bluefield Electric Company, capital, $10,000, has been incorporated by John H. Dingle, of Philadelphia, Pa.; John Graham, Jr., of Norfolk, Va.; Walter Graham, of Graham, Va., and others. The company proposes to construct an electric railway from Bluefield, W. Va., to Graham, Va.

HAGERSTOWN, MD.—The South Mountain Railroad and Electric Light and Power Company has been formed with G. W. Jacobs, Jr., of Philadelphia, Pa., as president; C. J. Young, superintendent and general manager; and George A. Davis, secretary. The railway will extend from Boonsboro to Keedysville, and will be operated in connection with the Catoctin Valley Electric Railroad and Power Company, of which Mr. Jacobs is also president. The Hughes & Rigby Engineering Company, of Baltimore, has the construction contract.

PROVINCETOWN, MASS.—Representatives of an electric company have conferred with prominent business men of Provincetown as to the advisability of establishing an electric plant for a street railway and for street lighting. The project calls for an estimated outlay of $75,000.

DALLAS, TEX.—The Dallas and Oak Cliff Railway Company will close a contract soon for equipping the entire line with electric power. The road is now operated by steam power.

MILWAUKEE, WIS.—Hurluf Petersen, of Milwaukee, has patented a new electric railway system, which will do away with the overhead wires in the running of electric railway cars and make use of underground conductors by means of an opening between the rails similar to a cable line.

BROOKLYN, N. Y.—The Brooklyn, Mapleton, Van Pelt Manor and Bath Beach Railway Company has been incorporated with a capital of $100,000, for the purpose of building and operating a surface railway from South Brooklyn to Gravesend Bay, a distance of six miles. The company is authorized to use horse power, electricity or cable. The directors are: James W. Murphy, of New York city; Michael McCormack and James A. Townsend, both of New Utrecht; Andrew Baird, William P. Rae and others, of Brooklyn.

New Manufacturing Companies.

CAMDEN, N. J.—The Charles S. Solomon Company; capital, $30,000. Incorporators: Charles S. Solomon, John S. Mount and Wilfred S. Griffiths. The company will manufacture mechanical and electrical machinery.

BALTIMORE, MD.—The Wenstrom Electric Company; capital, $1,000,000. Incorporators, Joseph P. Smith, John M. Denison, John E. Semmes and others. The corporation is formed for the purpose of taking the place of The Wenstrom Consolidated Dynamo and Motor Company and operating the plant of the defunct concern.

PROVIDENCE, R. I.—The Providence Electrical Works has been organized with a capital of $400,000, and will establish a plant for the manufacture of dynamos and a new wire, proof against poor insulation. The company will absorb the Consolidated Electrical Works, of Boston.

CHATTANOOGA, TENN.—The Electric Kindling Wood Company has been incorporated by W. O. Grady, Edward Scott, J. W. C. Critchell and others. The company will use patent electrical apparatus for preparing kindling wood for the market.

New Telephone Companies.

LACLEDE, MO.—The Winn County Telephone Company has been incorporated with a capital of $10,000, by J. C. Slater, Lee Myer, E. B. Allen and others.

Electrical Communication with Lighthouses and Lightships.

The Lighthouse Board has been successful in its experiments for establishing electric communication with lightships and lighthouses anchored at a distance of more than a mile from shore. This will attract the greatest interest in maritime circles all over the world. The board has been conducting these experiments for several years. The obstacles which have prevented connecting by electric cable a vessel swinging at anchor at sea with the land are said to have been overcome by attaching the core of the cable to the anchor chain, and making a conductor of the latter. Officials of the Treasury Department have recently talked by telephone with persons on board a lightship anchored over a mile from shore with the anchor chain used to complete the circuit.

The establishing of electric communication with lightships will result in the saving of many thousands of dollars annually to maritime interests. Passing vessels can easily and quickly be communicated with in cases of emergency, and ships in distress will frequently be reported to life-saving stations in time to dispatch relief vessels to save them. The lightship most distant from the shore is at the Nantucket Shoals. It is some 30 miles from shore, and the dangers of this locality have caused it to become known as the "graveyard of American shipping." The Lighthouse Board is gratified at the prospect of establishing electric communication with this lightship.

An Elementary Course in Electricity Provided by the Young Men's Christian Association of Brooklyn.

The Brooklyn Young Men's Christian Association has outlined, for the winter season of 1893-94, a course of lessons and lectures on the "Theory and Practice of Electricity." The following branches of the subject will be taken up in their order and discussed in as exhaustive a manner as the time will permit. The lectures will be illustrated by experiments performed before the classes.

Static electricity, its differences from dynamic electricity; how produced and stored, and the purposes to which it can be applied; magnetism, the important relation it bears to the commercial production of the electric current; the difference between permanent and electro-magnets, and how to design and calculate the power of the latter; the electric current, how distributed; its application to lighting and the transmission of power; the conducting medium, insulation and the dangers to be guarded against; the alternating and direct current incandescent systems of lighting and the arc circuit, together with a lecture upon the installation and management of lighting and power plants will be discussed.

The association has secured the services of H. A. Benedict, the electrical engineer employed by the Government at the Brooklyn Navy Yard, to take charge and direct the work outlined above.

History of the Telephone in Canada.

Mr. L. B. McFarlane read a paper under the above title before the recent convention of the Canadian Electrical Association. The following is an abstract of the paper:

Prof. Alexander Graham Bell's home was, for several years prior to the invention of the telephone, at Tutello Heights, on the outskirts of Brantford, Ontario, and it was there that many of his experiments in multiple telegraphy, and some of the earliest in telephony, were made.

The first experimental telephone line erected in Canada and used in this connection extended from the residence of the inventor's father across his garden. This line being found workable, it was afterwards continued on to the residence of the Rev. Thomas Henderson, in Brantford. Its successful working soon became noised abroad, and the novelty of the invention attracted many visitors from various parts of Ontario to listen to the then wonderful performance of the electric telephone; and presently Brantford became known as the "Telephone City." At this time the much condemned "Hello" had not come into use as a signal for conversation to begin; the words "Hoy Hoy" were considered most satisfactory. We must give a discriminating public the credit of choosing the less objectionable word, and be thankful that "Hoy Hoy" did not survive.

When the Canadian patent was issued to Professor Bell, he presented it as a gift to his father, Prof. Melville Bell, and the latter, believing a company or partnership unnecessary, appointed a general agent to exploit the Bell telephone. The latter visited the principal cities and towns and exhibited the old fashioned box telephone, with but little commercial success, however, as the difficulty of hearing the voice clearly rendered problematic its future value as a means of communication.

The first commercial telephone line was established at Hamilton, Ontario, in October, 1877, by the District Telegraph Company, who were quick to appreciate its value, and they, therefore, secured control of the invention for that district. This line connected together the residences of Messrs. Baker and Cory.

Mr. Edison at this time was not neglecting Canada as far as telephony was concerned. He had opened up correspondence early in 1877 with the City Electrician of Montreal, and forwarded two sets of his telephones for trial. These were placed on the telegraph line between Montreal and Quebec, a distance of 200 miles, and worked with remarkable distinctness, notwithstanding the presence of several relays in the circuit.

On September 15, 1877, a contract was entered into between these gentlemen, whereby the latter secured the sole and exclusive right to the telephonic inventions in Canada of Mr. Edison for a nominal sum, with the option of purchasing outright the patents for the sum of $10,000.

The element of competition was thus introduced at the outset of the business. Both parties claimed priority of patents, and threatened suit against all and sundry users; but while this rivalry continued until 1880, it was not known that Edison as early as 1877 had admitted Bell's claim to priority. This he did in a letter to his Canadian representative, under date of October 13, 1877, wherein Mr. Edison stated that:

"Bell has done absolutely nothing new over Reiss, except to turn Reiss' from a contact breaking into a non-contact breaking telephone with permanent magnet, and worked the thing up to a success. The records of the patent office will show that myself (Edison), Bell and Gray started nearly together on acoustic telegraphy for Morse working; that Bell and myself dropped this for speaking acoustic, and that I dropped it first and was working on it before Bell. However, Bell got ahead of me by striking a principle of easy application, whereas I have been plodding along on the correct principle, but harder of application."

The cry of infringement failed to deter lessees from using the telephones, and numbers of private lines were erected in Montreal and Toronto. These lines formed the nucleus of exchanges in these cities, which were first put into operation in 1878.

Montreal was equipped with the Edison apparatus, while the local company operating at Toronto adopted the Bell instruments. The Blake and Edison transmitters having been introduced, the business began to show some development.

The Western Union Telegraph Company, through its ally, the Gold & Stock Telegraph Company, secured, in 1878, control of the Edison patents for Canada, and the Montreal Telegraph Company were appointed agents for Ontario and Quebec, and the agents of the Western Union Telegraph Company in the maritime provinces were ordered to look after the telephone in the lower provinces. In telegraphic circles it was thought that whoever could control the telephone, could command the bulk of the telegraph business, and the telephone was used principally as a lever to this end. The Dominion Telegraph Company, then in fierce competition with the Montreal Telegraph Company, became alarmed at the apparently shrewd move on the part of its rivals, and immediately set about securing exclusive rights of the Bell telephone as a weapon of defense. Negotiations resulted in a contract between the patentee and the Dominion Telegraph Company, and the three telegraph companies started in a race to secure subscribers to their exchanges in the cities and towns from Windsor to Halifax, where exchanges inaugurated by local companies did not already exist. Some cities were, however, slow to appreciate the use of the telephone, notably Ottawa and St. John, N. B. At Ottawa an active canvass was commenced, but, in order to save time, a complete telephone exchange outfit was shipped there. The canvass was unsuccessful; no subscribers were forthcoming, and the plant had to be stored until the public could be educated into the use of the telephone. At St. John only one subscriber could be secured after two weeks canvassing. A brilliant idea then occurred to the manager of the opposing company at this point and was carried to a successful issue. It was to open a free telephone exchange, on trial. This at once demonstrated the necessity for an exchange, and soon two competing exchanges were working, and unable to keep pace with the paying orders offered.

This struggle between the telegraph companies, which signally failed in its main object of diverting telegrams to any one company, resulted not alone in cutting telephone rates to absurdly low figures, but in doing business absolutely without charge. To such competition there could be but one end, and it was soon reached. There had been a large capital outlay, and the revenue did not by any means meet the expenses. A proposition at this time to form a separate telephone company, independent of all telegraph companies, was made by Mr. Charles F. Sise, the present chairman of the Bell Telephone Company of Canada, and Mr. Hugh C. Baker, manager of the District Telegraph Company of Hamilton. The suggestion of these gentlemen was gladly accepted by the interested companies and patentees, and by the public at large, who were suffering in most cities from the annoyance of two telephone exchanges. The Bell Telephone Company was thereupon organized and incorporated in 1880, when it took over all the existing plants and patents, reorganized and consolidated the exchanges, and began the manufacture of all kinds of telephonic apparatus.

The work of constructing lines connecting adjoining places was begun on the single wire plan, and towns and villages within a radius of 100 miles were given direct means of telephonic communication. This added to the value of the exchanges, and as the business prospered a question was raised by interested parties anxious to embark in the business as to the validity of the Bell patent. Two telephone companies were formed by these parties, and local competition at a few points ensued. The patent dispute was brought before the Minister of Agriculture at Ottawa, and, as you all know, the patent was lost to the Bell Telephone Company in 1885. A similar fate befell the Blake transmitter patent, and as the Minister's decision was final and irrevocable, the telephone field was opened to all comers. Notwithstanding this blow, the Bell Telephone Company continued to rapidly increase its list of subscribers and revenue, and their competitors were left to the tender mercies of their creditors, who found the venture, while it succeeded in breaking the patents, had proved an unprofitable financial undertaking. Later on competition appeared in several localities, but, as the connections of these opposing concerns were necessarily limited, they again demonstrated the inutility of working a duplicate telephone system in a city or town by disappearing from the scene without ever having paid a dividend.

A local company was formed in Nova Scotia and New Brunswick and after a short struggle with the Bell Telephone Company an agreement was arrived at whereby each of these provinces would have a separate telephone company, the Bell Telephone Company withdrawing from the field, but retaining an interest in each company. These companies have covered their territories with trunk lines and exchanges.

The local company of Prince Edward Island, which had previously been formed by the Bell Telephone Company, has, however, reached the highest stage of expansion, it having a net-work of wires which reaches every town and village on the island.

The Bell Telephone Company were early in the field in Manitoba and the Northwest, and have kept pace with the development of this territory by opening stations at all points where business would warrant.

British Columbia is served by local companies, using the same type of instrument as Eastern Canada. These companies have been most energetic and progressive in their policy. As an indication of this, we can note the fact that Vancouver, B. C., was the first exchange in Canada to alter its entire system at great cost and give each subscriber a separate metallic circuit line.

KINDRED INTERESTS

Messrs. Lord & Thomas, the well-known advertising firm of Chicago, have kindly remembered the ELECTRICAL REVIEW office with a neat advertising rule. We hope to be kept busy measuring new advertisements.

The H. W. Johns Manufacturing Company, 87 Maiden Lane, New York, have sent out a carefully prepared pamphlet entitled "Insulation." It includes illustrations and descriptions of all their well-known insulating specialties made of asbestos, vulcabeston and moulded mica.

The Universal Electric Launch Co., 45 Broadway, New York, have sent out a very well arranged and complete catalogue describing their electric launches and auxiliary electric yachts. They also issue special catalogues of "Yachts," "Storage Batteries" and "Marine Electrical Apparatus."

The Shawmut Fuse Wire Co., 161 High street, Boston, has sent out an interesting pamphlet entitled "Tested Fuse Wire and Fuse Links," containing a great deal of valuable information on the subject. The company's now famous treatise on "Fuse Wire and Its Uses" is included in this pamphlet.

Queen Testing Sets.—Queen & Co., incorporated, Philadelphia, have a small lot of old type portable testing sets which they are now closing out at reduced prices, ranging from $65.00 to $95.00 each. These instruments are built on the "decade" plan and contain galvanometers of great sensibility. They appeal at once to all who want real bargains, being perfectly new, and are only offered at a "cut" to make room for other stock. Interested parties should investigate the above, for it is an unusual offer.

The Central Electric Company, Chicago, desire to call particular attention to the Eichberg Patent Tree Insulator, listed in their new general catalogue. This is a new device which they have recently put upon the market, and which is intended to overcome the trouble brought about by the destruction of the insulation on line wire, caused from constant rubbing against branches of trees. The insulator perfectly insulates the line and gives it plenty of play when attached to a branch, permitting it to move in any direction with the swaying of the limb. This device is listed and described fully in their new catalogue.

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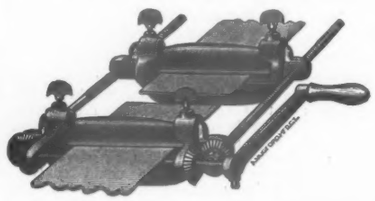

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